

D3 MARINE ENGINEERING

SEMESTER I				
NO.	CODE	COURSES	CRD	HRS
1	603101A	Indonesian Language	2	2
2	603102A	English I	3	3
3	603103A	Indonesian Values and Ideology	2	2
4	603207A	Mathematics I	2	4
5	603208A	Physics	2	4
6	603209A	Engineering Mechanics	1	2
7	603210A	Introduction to Ocean Engineering	1	2
8	603211A	Materials Science	3	6
9	603320A	Mechanical Technology	3	6
10	603321A	Engineering Drawing	2	4
TOTAL			21	35

SEMESTER II				
NO.	CODE	COURSES	CRD	HRS
1	603212A	Mathematics II	2	4
2	603213A	Physics II	2	4
3	603214A	Fluids Mechanics	1	2
4	603215A	Thermodynamics	2	4
5	603323A	Ship Propulsion & Drive System	3	6
6	603324A	Elementary - Ship Construction Engineering *)	4	8
7	603325A	Advanced Mechanical Technology	2	4
8	603443A	Enterpreneurship	2	4
TOTAL			18	36

SEMESTER III				
NO.	CODE	COURSES	CRD	HRS
1	603104A	English II	2	2
2	603216A	Dynamic	1	2
3	603322A	Computer-Aided Design Practice	2	4
4	603326A	Welding and Fabrication Engineering	2	4
5	603327A	Piping System	3	6
6	603328A	Marine external combustion engine	3	6
7	603329A	Engine Maintenance and Repair	3	6
8	603330A	Pneumatics & Hydraulics	3	6
TOTAL			19	36

SEMESTER IV				
NO.	CODE	COURSES	HRS	HRS
1	603218A	Refrigeration system	3	6
2	603219A	Fluid Machine	3	6
3	603332A	Shipboard System	2	4
4	603333A	Ducting System	1	2
5	603334A	CNC	2	4
6	603335A	Control and Monitoring Systems *)	1	2
7	603336A	Poros, Stern Tube & Propeller	2	4
8	603337A	Ship Electrical System	3	6
9	603440A	Occupational Health and Safety	1	2
TOTAL			18	36

SEMESTER V				
NO.	CODE	COURSES	CREDI T	HOUR S
1	603105A	Religious Study	2	2
2	603106A	Advanced English	3	3
3	603338A	Special Ship System	1	2
4	603339A	Elective Course (Capita Selecta)	1	2
5	603217A	Machine Elements	1	2
6	603444A	Engine Room Lay-Out	4	8
7	603445A	Shipyards Management	2	4
8	603446A	Research Methodology	1	2
9	603331A	Ship Loading and Unloading System	2	4
TOTAL			17	29

SEMESTER VI				
NO.	CODE	COURSES	CREDI T	HOUR S
1	603441A	Industrial Internship Program *)	13	30
2	603442A	Project Work	5	10
TOTAL			18	40

SYLLABUS

NO.	COURSE TITLE	CREDITS/ HOURS	OBJECTIVES/COURSE TITLE/REFERENCES
1.	Indonesian Language	2/2	<p>Objectives: Students are able to use Bahasa Indonesia well and correctly in arranging a research</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. The relationship of thought and scientific language 2. Theme, thesis, topic and title 3. Scientific articles as a system 4. Diction: the meaning, content and broad understanding 5. Effective Sentences 6. Paragraphs and that stuff 7. Cohesion, coherence and development of ideas 8. Reasoning 9. Spelling and punctuation 10. Quotes and literature <p>References:</p> <ul style="list-style-type: none"> - Poespoprodjo, "The logic of reasoning sciences: basics of logical thinking, critical, analytical, independent and orderly". - Keraf, G., "Composition; Diction and Language style; Argumentation and Narration; Exposition". - Widyaprakosa, S., "Philosophy Thinking (Preliminary Study on Philosophy Science)". - Kerlinger, F.N., "The Principles of Behavioral research". - Susanto, A.S., "Communication in Theory and Practice". - Effendi, O.U., "The Dynamic of Communication". - Rakhmat,J., "The Method of Communication Research".Etc.

2.	English I	2/4	<p>Objectives: Students are able to use English to communicate in social life, understand English passage in form of information, and are able to write it in paragraph</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. Social communication 2. Factual information 3. Works instruction 4. Filling forms 5. Letters and documents <p>References:</p> <ul style="list-style-type: none"> - Richards, J.C., "Breakthrough" - Alexander, L.G., "Comprehension, Precis & Composition" - Hill, L.A., "Elementary Anecdotes in American English". - Comfort, J., "Basic Technical English". - Hadfield, J., "Simple Speaking Activities"
3.	Mathematic I	2/4	<p>Objectives: Students are able to apply basic mathematics concept to support other subjects.</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. Determinant 2. Matrix 3. Vector Algebra 4. Complex Number 5. Differential 6. Application of Differential 7. Integral. <p>References:</p> <ul style="list-style-type: none"> - Hand Out of Mathematic I & II, FMIPA ITS. - Bird, J.O and A.J.C, May Technicians, Longman Scientific & Technical, 1978. - Stroud, K.A, Mathematic for Engineer, Erlangga Press, 1995. - Baisuni,H.M.H, Kalkulus, UI Press, 1986. - Irwin, J.R, Essentials of Applied Mathematics, Edward Arnold Ltd., 1986
4.	Physics I	2/4	<p>Objectives: Students are able to discern the basic law of physic and apply it using mathematical equation and introducing basic engineering concepts.</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. Vector, velocity and acceleration. 2. Linear and curved motion 3. Newton law 4. Friction and centrifugal motion 5. Work, kinetic energy and potential 6. Gravitation and centre of mass 7. Momentum and stiff Momentum 8. Stiff object equilibrium 9. Elasticity 10. Hydrostatic and fluid dynamic 11. Thermodynamic laws 12. Ideal gas and vapor cycle

		<p>References:</p> <ul style="list-style-type: none"> - Halliday and Resnick, Fundamental of Physics - Alonso and Finn, Fundamental University Physics, Vol I - Dosen FMIPA ITS, Diktat Fisika I - Hand Out Fisika I, Jurusan TPK – PPNS
5.	<p>Engineering Mechanics</p>	<p>1/2</p> <p>Objectives: Students are able to discern principle of force, stress and bending moment then students are able to calculate shear stress, bending moment, stress, and inertia moment and modulus section. At finally students able to choose section type for distributed loading and point loading.</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. Principle of force equilibrium. 2. Safety factor. 3. Free body diagram 4. Stress and stress distribution. 5. Hooke Law 6. Centroid and inertia moment 7. Shear force and bending moment 8. Shear force diagram and moment 9. Section modulus 10. Torque and column <p>References:</p> <ul style="list-style-type: none"> - Popov, E.P., Mechanics Of Material, Prentice Hall, Inc., 1976 - Timosenko, SF and Young DH, Elements of Strength Of Material, 5th. Edition, Van Nostrandamaruzzen, 1968. - William a Nash, Strength of Material, Schaum Series, Me Graw Hill, 1971
6.	<p>Introduction to Ocean Engineering</p>	<p>1/2</p> <p>Objectives: Giving basic understanding about theory of shipbuilding, requirement and the function of various systems in ship and other ocean structure/floating structure.</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. Ship classification 2. Ship principle dimension 3. Displacement, 4. Form coefficient 5. Lines plant and general arrangement. 6. Numerical integration 7. Hydrostatic curve 8. Trim 9. Stability 10. Classification society and marine organization 11. Basic ship propulsion, ship supporting system, and deck machinery <p>References:</p> <ul style="list-style-type: none"> - Van Mannen, Principle of Naval Architecture, SNAME, 1988 - Edward, LA, Theoretical of Naval Architecture, SNAME, 1988. - A Group of Author, Marine Engineering, edited by R.L Harrington, SNAME, 1992. - Taylor DA, Introduction to Marine Engineering, Butterworth, 1985. - Pouder CC, Marine Diesel Engine, Butterwrth, 1979

7.	Material Sciences	2/4	<p>Objectives: Students are able to discern metal, metal structure, its application and production technique. Students are able to evaluate metal mechanical properties and to understand welding quality by Non Destructive Test (NDT) and Destructive Test.</p> <p>Course Topics: <u>Class :</u></p> <ol style="list-style-type: none"> 1. Mechanical properties and material test 2. Crystal structure 3. Metal deformation, iron, and steel 4. Carbon iron, cast iron, alloy metal and its application 5. Other metal <p><u>Laboratory:</u></p> <ol style="list-style-type: none"> 1. Destructive test 2. Tank test 3. Impact test 4. Hardness test 5. Macro etza test 6. Fracture test 7. Non destructive test, visual test, magnetic, ultrasonic, radiography (x-ray), and penetrant test <p>References:</p> <ul style="list-style-type: none"> - Anwir, BS., Ilmu Bahan Logam I & II, Bharata Karya Aksara, Jakarta, 1976. - Davies DJ. & Oelmann LA., Metallurgical Process Production Technology, Ditman Publishing Ltd, London 1985. - Higgins RA., Materials The Engineering Technician, Second ed., Copy Right Licensing Agency Ltd. London 1987. - Measurement of mechanical properties. - Testing and inspection of Engineering Materials. - Non Destructive Testing, Barry, Hull, Vermanjau
8.	Mechanical Technology	3/6	<p>Objectives: Students are able to use/apply machinery measurement tools and worktable tools, tool machine operation and its system. Finally student are able to estimate the working time in machinery work.</p> <p>Course Topics: <u>Class :</u></p> <ol style="list-style-type: none"> 1. Measurement method 2. Lay out 3. Worktable job 4. Sheet metal 5. Metal chip and lubrication 6. Drilling machine 7. Working machine plan 8. Saw 9. Lathe, milling, scraper, and grinding machine. <p><u>Workshop:</u></p> <ol style="list-style-type: none"> 1. Stud grip fabrication 2. Parallel clamp fabrication <p>References:</p>

			<ul style="list-style-type: none"> - Heinrich, G., All about Machine Tools, Wiley eastern Ltd, 1965. - Vidosic, J .P, Metal Machine and Forming Techology, The Ronald Press Co. - Surdiat dan shinroku S, Pengetahuan Bahan Bahan Teknik, Pradnya Paramita, Jakarta, 1985. - Dieter, Mechanical Metallurgy, McGraw Hill, New York 1986. - Modul Kerja bangku dan Modul Bubut, PPNS - ITS
9.	Engineering Drawing	2/4	<p>Objectives: Students are able to draw and read a shop draw using classification/ standard rule correctly</p> <p>Course Topics: <u>Class :</u></p> <ol style="list-style-type: none"> 1. Geometric construction 2. Media and drawing equipment 3. Three dimension object presentation 4. Projection 5. Measurement Standard/code 6. Shading 7. Trimming 8. Lofting 9. Surface roughness techniques, threading and tolerance. 10. special marking/treatment <p><u>Studio Drawing:</u></p> <ol style="list-style-type: none"> 1. To draw basic mechanical Element 2. To draw advanced mechanical element <p>References:</p> <ul style="list-style-type: none"> - Sato GT dan Hartanto NS, Menggambar Mesin Menurut Standar ISO, PT. Pradnya Paramita. Jakarta 1983 - Luzader JW dan Hendrasin H, Menggambar Teknik untuk Disain, Pengembangan Produk dan Kontrol Numerik, erlangga, Jakarta, Edisi ke 8, 1986 - Hey La et al, Ilmu Menggambar Bangunan Mesin, Buku Teknik Starn, Jakarta, 1952
10.	CADD	3/6	<p>Objectives: Students are able to plan/design shop drawing/ machine design drawing by using Auto CADD</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. Engineering drawing review 2. Coordinate system 3. Drawing 4. Entity 5. Modification/editing 6. Dimension 7. 2D Drawing 8. 3D Drawing 9. Basic Isometric Drawing 10. Plotting 11. Drawing scale Arrangement 12. Assignments (topic is machine design drawing) <p>References:</p> <ul style="list-style-type: none"> - Sato GT dan Hartanto NS, Menggambar Mesin Menurut Standar ISO, PT. Pradnya Paramita, Jakarta 1983

			- Hey La et al, Ilmu Menggambar Bangunan Mesin, Buku Teknik Starn, Jakarta, 1952
11.	Indonesian Values and Ideology	2/2	<p>Objectives: Students are able to discern, comprehend, and inspire Civilization and education of country defense (Pendidikan Pendahuluan Bela Negara(PPBN).</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. Human Right and duty 2. Democracy & human right (HAM) 3. The Archipelago concept 4. National Defense concept 5. National Strategy Politics 6. GBHN 7. Law Program of National Defense 8. National Importance and Role in International Relationship 9. Internationalization of fighting values in globalization era 10. Basic theory of geopolitics and geographic strategy <p>References:</p> <ul style="list-style-type: none"> - Cassese, A., Ham di dunia yang berubah, Yayasan Obor, Jakarta, 1994. - Soelaeman, MM. Ilmu Sosial Dasar: Teori dan Konsep Ilmu Sosial, Eresco, Bandung, 1995. - Soemarwoto, O., Indonesia dalam Kancah Isu Lingkungan Global, Pustaka Utama, Jakarta, 1992. - Sanit, A., Reformasi Politik, Jogjakarta, 1998 - Soedarsono, S., Penyemaian Jati Diri, Strategi Membentuk Pribadi, Keluarga dan lingkungan menjadi Bangsa yang Profesional, Bermoral dan Berkarakter, Gramedia, Jakarta, 2000.
12.	Mathematics II	2/4	<p>Objectives: Students are able to apply basic mathematics in other subjects</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. Specific integral application (Wide, Volume, Arc length, surface wide in coordinate point and Polar Coordinate) 2. Mass center 3. Inertia moment 4. Fluid pressure 5. Work and energy 6. Numerical integration 7. Rank and series 8. Basic differential equation 9. Basic statistics <p>References:</p> <ul style="list-style-type: none"> - Diktat Kuliah Matematika 11, FMIPA ITS. - Bird, J.O and A.J.C. May Technicians, Longman Scientific & Technical, 1978. - Stroud, K.A, Matematika untuk Teknik, Penerbit Erlangga, 1995. - Baisum, H.M.H, Kalkulus, UI Press, 1986. - Irwin, J.R, Essentials of Applied Mathematics, Edward Arnold Ltd., 1986
13.	Physic II	3/6	<p>Objectives: Students are able to discern and apply Physic Law which related</p>

with electricity and magnet. Students are able to apply physics principle in simple practice/ application

Course Topics:

Class:

1. Coulomb Law
2. Strong electricity field,
3. potential electricity, potential electricity energy
4. Capacitance and capacitor
5. Capacitor energy and capacitor circuit
6. Gauss Law
7. Electric current and DC (Direct current) circuit
8. Magnetic field
9. Magnetic coil
10. EMF and GGL induction
11. Lenz Law
12. AC (Amplitude Current)
13. Mesh Current Network Analysis Method

Laboratory:

1. To set up experiment
2. To install measurement tools
3. To use the measurement tool
4. Experiments result documentation
5. Experiment result data analysis
6. Diagonal motion
7. Centrifugal force
8. Pulley/tackle system
9. Rotational Movement in wheel
10. Inertia Moment
11. Mathematics Swing & Physic Swing
12. Caloricmeter
13. Archimedes Law
14. Transformator

References:

- Zemansky, S., College Physics
- Halliday, D., & Resnick, R., Physics
- Edmimster, J. A., Electric Circuits, Schaums Outline Series.
- Petunjuk Praktikum Fisika, PPNS-ITS

14.

Fluid Mechanics

1/2

Objectives:

Students are able to discern basic design of fluid machinery installation

Course topics:

1. Fluid Characterization
2. Fluid Static
3. Fluid Measurement
4. Fluid Machinery
5. Steady flow in the closed tunnel
6. Flow in the open tunnel
7. Dimensional analysis and dynamic equation
8. Nil Fluid Flow
9. Sink object forces

References:

- Steeter, V.L., Benyamin E.W. ,Fluid Mechanics, Me Graw Hill,1981.
- Giles, V., Fluid Mechanics and Hydrolic, 2nd ed., Me Graw Hill,1977.

			<ul style="list-style-type: none"> - Douglas, J.F, Solving Problems in Fluid Mechanics, Volume 1 & 2, Logman Scientific & Technical, 1986. - Boyle, W.P. Applied Fluid Mechanics, McGrawHill Ryerson Ltd,1986. -
15.	Thermodynamics	2/4	<p>Objectives: Students are able to discern thermodynamic unit system, thermodynamic laws, process cycle, heat transfer and its application in the engine and heat exchanger</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. Thermodynamic unit system 2. Characterization of Thermodynamic substance 3. Energy and working concept 4. Thermodynamics law and its application 5. Ideal gas law and its characterization. 6. The application of thermodynamic concept at combustion engine, steam turbine, gas turbine, coolant engine, and heat pump 7. Heat transfer theory, conduction, convection and radiation 8. Heat exchanger <p>References:</p> <ul style="list-style-type: none"> - Reynolds, W.C.,Perkins, H.C., Thermodinamika Teknik, Terjemahan Filino Harahap, Eriangga, Jakarta 1980. - Doolittle & Hale, Thermodynamic For Engineers. - Jones & Howkins, Engineering hennodynamic. - Joel, R., Basic Engineering Thermodynamics in SI Units, 3rd ed., Longman Group Ltd, 1984. - Cengel, Y.A., Heat and Mass Transfer, A Practical Approach, 3rd ed., McGraw-Hill, Boston, 2007
16.	Ship Propulsion System	3/6	<p>Objectives: Students are able to discern ship resistance and propulsion principle then student able to choose and determine main propulsion and propeller type and understand diesel engine as the main engine and auxiliary ship engine</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. Philosophy of ship propulsion system 2. Ship resistance type 3. To determine total ship resistance 4. Propeller type 5. Geometry propeller 6. Propeller cavitations. 7. Main engine choosing 8. Engine Propeller Matching 9. Basic thermodynamic 10. Diesel work performance 11. Fuel system and combustion process 12. Diesel engine type 13. Combustion chamber 14. Turbocharger & supercharger 15. Low speed (RPM) diesel engine 16. Medium speed (RPM) diesel engine 17. High speed (RPM) diesel Engine 18. Exhaust gas Analysis <p>References:</p>

			<ul style="list-style-type: none"> - Harvald, S. A., Resistance and Propulsion, John Wiley, 1983 - Schneekluth, H., Ship Design Economy and Efficiency, 1991 - Gallin C, Ships and Their Propulsion Systems - Carlton, J.S, Marine Propellers and Propulsion, Butterworth-Heinemann, Ltd., 1994 - Harrington, Marine Engineering, SNAME, 1977 - Bowden, Marine Diesel Oil Engines, 10th ed., 1984 - Pounder, Marine Diesel Engine, 1979
17.	Advance Mechanical Technology	2/4	<p>Objectives: Students are able to operate tool machine and prepare cutting tool, workpiece and choosing of tool machine with high level accuracy.</p> <p>Course Topics: <u>Workshop:</u></p> <ol style="list-style-type: none"> 1. Face turning 2. Cylinder turning 3. Cones turning 4. Threading 5. Shaping 6. Milling 7. Surface Grinding 8. Cylinder grinding <p>References:</p> <ul style="list-style-type: none"> - H, Gerling. ,All About Machine Tools - Sctcnements, A., Pengerjaan Logam DGW Mesin - Tool Design Construction, PMS- ITB. - Modul dan Jobsheet Praktek Teknologi Mekanik, PPNS-ITS
18.	Safety Engineering	1/2	<p>Objectives: Student are able to understand safety engineering aspects</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. Learn accident type at working area and its prevention 2. History of safety engineering 3. Safety Organization Diagram 4. Safety work regulation and law 5. Human error factor 6. Fire Safety and its prevention. 7. Shipboard Safety and explosion potential, Safety of Esetilen equipment and Electromotor, safety of hazard/ dangerous material in working area, role and Profession Community. <p>References:</p> <ul style="list-style-type: none"> - Occupational health and safety, Billy hammer - Hygiene industry, Sumakmur PK - Higiene industry, Soeripto M
19.	English II	1/2	<p>Objectives: Students are able to response a passage about a problem and give exact solution in using English</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. Meetings 2. Cases 3. Presentation <p>References:</p> <ul style="list-style-type: none"> - David Peaty, Something to Talk About - Hutchinson, T., & Waters, A. .Interface

			- Hadfield, J., Simple Writing Activities
20.	Dynamics	1/2	<p>Objectives: Students are able to discern theory, calculation and object motion.</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. Object motion equation 2. Work and energy 3. Impulse and momentum 4. Static Force and Inertia force of machine element 5. Wheel force analysis 6. Balancing 7. Critical revolution velocity of axis 8. Basic of vibration <p>References:</p> <ul style="list-style-type: none"> - Holowenko, A.R., Dynamics Of Machinery - George, H. M., Kinetics and Dynamics - Loewy R.G and V.J Piarolly, Dynamics of Rotating Shafts - Martin, G.B., Kinematics & Dynamic of Machine, Mc. Graw Hill co.. New York, 1969 - Hibbeler, R.C., Engineering Mechanics, Dynamics, 4th ed., 1986
21.	Machine Element	1/2	<p>Objectives: Students are able to discern force theory, moment and stress machine element. Students are able to make a planning of machine in a system. They are also able to understand power transmission principle and consideration of choosing power transmission system</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. Energy principle, moment, stress in static and dynamic load. 2. Transmission 3. Shaft and spie 4. Bearing and lubrication 5. Coupling and Brake 6. Belt and Chain 7. Gear 8. Thread and pedal 9. Cam 10. Power transmission function and its application in the ship. 11. Mechanical, electrical, hydraulic and pneumatic transmission <p>References:</p> <ul style="list-style-type: none"> - Smith, Marine Auxiliary Machinery - Spott, M.F., Design of Machine Element - Peraturan Klasifikasi untuk permesinan - Harrington, Marine Engineering
22.	Welding and Fabrication	2/4	<p>Objectives: Students are able to discern metal welding mechanism and type, do the simple metal welding (fabrication), understand safety work in welding working area and are able to discern the metal structure deformation in HAZ.</p> <p>Course Topics:</p> <p><u>Class :</u></p> <ol style="list-style-type: none"> 1. Welding Metallurgy

			<ol style="list-style-type: none"> 2. Welding and cutting type. 3. Hand welding & Gas welding 4. Soldering/ Brazing 5. HAZ (Heating Area Zone) 6. MIG/MAG Welding 7. Electricity Welding <p><u>Workshop :</u></p> <ol style="list-style-type: none"> 1. SMAW <ul style="list-style-type: none"> - Start up - Butt joint. Lap joint, T-joint 2. OAW <ul style="list-style-type: none"> - Start up - But joint. Lap joint, T-joint <p>References:</p> <ul style="list-style-type: none"> - G.A. Kennedy, Welding Technology, 2nd ed, the Bobbs Meril company, Inc, 1982 - AWS, Welding Hand Book - ASME, Section IX - AWS D2 - Cary, HB, Modern Welding Technology, 2bd ed, Pretice Hall, Englewoods cliffs, 1989 - H. Wiryosunarto dan Okumura T., Teknologi Pengelasan Logam, Pradnya Paramita, Jakarta ,1991.
23.	Piping System	3/6	<p>Objectives: Students are able to discern basic piping systems, basic design and its testing and standard piping symbol</p> <p>Course Topics:</p> <p><u>Class :</u></p> <ol style="list-style-type: none"> 1. Piping Standard 2. Pipe Specification & Material 3. Piping Symbol 4. Piping System Design and Installation 5. valves 6. Fitting 7. Piping System Drawing 8. Pipe Supporting 9. Pipe length calculation 10. Capacity and velocity in the pipe <p><u>Workshop:</u></p> <ol style="list-style-type: none"> 1. Isometric piping drawing system 2. Fitting and bending pipe <p>References:</p> <ul style="list-style-type: none"> - Raswari, Teknologi dan Perencanaan Sistem Perpipaan, UI Press, Jakarta, 1986 - Reno, C.K., Piping Handbook, Me. Graw Hill co., 1967 - Edward P. Georking, Marine Piping Hand Book - Dowson, S., Marine Auxiliary Machinery - Marine and Offshore & Piping Systems - Harrington, Marine Engineering
24.	Marine External Combustion Engine	3/6	<p>Objectives: Students are able to understand the steam turbine and gas turbine principle, construction, installation and other auxiliary equipment, and students are able to apply the steam turbine as the main ship propulsion</p>

			<p>Course Topics: Class :</p> <ol style="list-style-type: none"> 1. Steam cycle and water pressure 2. Steam-gas turbine classification 3. Steam-gas turbine construction 4. Installation and auxiliary apparatus of steam-gas turbine 5. Fuel, fuel system and combustion process 6. Ship propulsion design and plan on that using steam/gas turbine <p>Practical/Laboratory work : Efficiency , performance and heat balance analysis for diesel engine, steam and gas turbine</p> <p>References:</p> <ul style="list-style-type: none"> - Birnie, Marine Steam Engine and Turbine, 4th Ed., 1980 - Harrington, Marine Engineering, SNAME, 1977 - Shyakhin, Steam Turbines - Milton, J.H., Marine Steam Turbines - Woodward, J.B, Marine Gas Turbines, John Willey & Sons, New York, 1975 - Dietsel, p., Sriyono, D., Turbin Pompa dan Kompresor, Erlangga, 1988 - Akimov, Marine Power Plant, Peace Publishing, USSR -
25.	<p>Marine Combustion Engine Repair and Maintenance</p>	3/6	<p>Objectives: Students are able to discern the combustion engine maintenance technique, find out the source of the damage, and repair the control drive and supported/auxiliary ship engine</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. Periodic combustion engine maintenance 2. Engine manual handbook 3. Engine part measurement 4. Breakdown maintenance tutorial 5. Cylinder Head, liner cylinder, cylinder block, compression cylinder, valve, piston and ring piston, crank shaft, connecting rod, cam shaft, and fuel injection apparatus. 6. Engine parts testing 7. Find out the damage source 8. Repair the broken engine part 9. Efficiency / work performance and heat balance analysis of diesel engine <p>References:</p> <ul style="list-style-type: none"> - Taylor, C.F.,The Internal Combustion Engine, in theory and practice. Vol. 1, the Technology Prewa of The Massachusetts Institute of Technology & John Wiley & Sons, New York, 1960 - Petrovky H., Marine Internal Combustion Engines, MIR Publiser, Moscow, 1968 - Arismunandar, W., & Tsuda, K., Motor Diesel Putaran Tinggi, Pradnya Paramitha, Jakarta, 1983 - Peraturan Klasifikasi
26.	<p>Pneumatic & Hydraulic</p>	3/6	<p>Objectives: Students are able to discern mechanical control system using pneumatic and hydraulic. Students are able to discern PLC (program logic control) principle and design the PLC application in controlled system</p>

			<p>Course Topics:</p> <p><u>Class</u></p> <ol style="list-style-type: none"> 1. Hydraulic principle 2. hydraulic system components 3. Pneumatic principle 4. Pneumatic system components 5. sequence & logic 6. Electric pneumatic principle 7. Electric pneumatic system components 8. Sequence and cascade <p>PLC</p> <p><u>Laboratory:</u></p> <ol style="list-style-type: none"> 1. Job sheet Hydraulic I s/d X 2. Job sheet Pneumatic I s/d V 3. Job sheet Electro Pneumatic I s/d V 4. Job sheet PLC I s/d X <p>References:</p> <ul style="list-style-type: none"> - Ernset C. Fitch, Fluid Power and Control System, McGraw-Hill Book Co., New York, 1966 - Festo Didactic, Fundamentals of Pneumatic Control Engineering, Esslingen, 1987 - Pippenger, J., Hicks, T., Industrial Hydraulics, McGraw-Hill Book Co., Singapore, 1985. - Petunjuk Praktikum Pneumatik & Hidrolik I & II.
27.	<p>Ship Loading and Unloading System (Cargo System)</p>	2/4	<p>Objectives:</p> <p>Students are able to discern type, function, system and deck machinery system basic calculation</p> <p>Course Topics:</p> <p><u>Class :</u></p> <ol style="list-style-type: none"> 1. Steering Gear 2. Bow/ Stern Thruster 3. Mooring 4. Ship Stabilizer 5. Loading-unloading system 6. Deck Equipment: Anchor, windlass, Devit, safety boat, etc. 7. Inert Gas System 8. Crude oil Washing <p><u>Drawing Project</u></p> <ol style="list-style-type: none"> 1. Completing deck machinery system in, shop drawing. General arrangement: Anchor, windlass, devit, rudder, etc. <p>References:</p> <ul style="list-style-type: none"> - Smith, Marine Auxiliary Machinery, Butterworth. - Khettagurov, Marine Auxiliary Machinery and Systems, Moskow Publisher - Group of Author edited by Roy L. Harrington, Marine Engineering, SNAME, New York, 1977 - Peraturan Klasifikasi -
28.	<p>Refrigeration System</p>	3/6	<p>Objectives:</p> <p>Students are able to discern refrigeration and air conditioning principle and students are able to design cargo storage and ship air conditioning refrigeration system.</p> <p>Course Topics:</p> <p><u>Class:</u></p> <ol style="list-style-type: none"> 1. Basic Refrigeration system

			<ol style="list-style-type: none"> 2. psychometric chart 3. Vapor compression cycle 4. Multistage pressure system. 5. Cooling load calculation 6. Design Condenser , evaporator and compressor 7. Expansion valve 8. Refrigerant type and its application 9. Heat Exchanger <p><u>Laboratory:</u></p> <ol style="list-style-type: none"> 1. Refrigeration experiment test 2. Refrigeration system analysis 3. P-h diagram plotting 4. COP refrigeration experiment test 5. Trouble shooting technique in refrigeration system 6. Heat Exchanger <p>References:</p> <ul style="list-style-type: none"> - Stocker, W.F, Refrigeration and Air Conditioning - Harrington, Marine Engineering - Althos, A.D. Modern and Air Conditioning - Shulters, Marine Air Conditioning and Refrigeration - Modul Praktikum Sistem Penunjang Kapal, PPNS-ITS -
29.	Fluid Machine	3/6	<p>Objectives: Students are able to discern fluid machinery principle, to plan fluid machinery utility system need in ship and industry, to measure fluid machinery performance and to maintenance and repair fluid machinery unit.</p> <p>Course Topics:</p> <p><u>Class:</u></p> <ol style="list-style-type: none"> 1. Pump type 2. Pump principle 3. Pump performance characteristic 4. Flow rate 5. Pump power calculation 6. Pump selection principle for various systems on ship 7. Compressor principle 8. Compressor power calculation 9. Pump and compressor preventive maintenance technique <p><u>Laboratory:</u></p> <ol style="list-style-type: none"> 1. Pump and compressor maintenance and repair technique. 2. Pump Experiment test for pump performance characterization 3. Francis Turbine test 4. Fan test <p>References:</p> <ul style="list-style-type: none"> - Khetagurov, Marine Auxiliary Machinery and System - Harrington, Marine Engineering - Igor, J.H, Pump Handbook - Sularso, Pompa dan Kompresor - Peraturan Klasifikasi - Modul Praktikum Sistem Penunjang Kapal, PPNS-ITS -
30.	Shipboard System	2/4	<p>Objectives:</p>

			<p>Students are able to discern main engine and auxiliary motor ships service system, and students are able to design general shipboard system.</p> <p>Course Topics:</p> <p><u>Class :</u></p> <ol style="list-style-type: none"> 1. Fuel system 2. Design/plan Daily tank 3. Separator 4. Heater 5. Lubrication system 6. Filter 7. Settling tank 8. Motor cooling system 9. Heat Exchanger 10. Design heat exchanger <p><u>Laboratory :</u></p> <ol style="list-style-type: none"> 1. Air starting system 2. Design air starting system vessel 3. Bilga and ballast system 4. Fire extinguisher system 5. Fire extinguisher equipment 6. Fire extinguisher system rule 7. Desalination 8. Sanitary system <p>References:</p> <ul style="list-style-type: none"> - M.Khetagurov, Marine Auxiliary Machinery and System - Harrington, Marine Engineering - Igor, J.H, Pump Handbook - Kern D.Q Process Heat Transfer - Peraturan Klasifikasi - Heat Exchanger Design Handbook, Gulf Publishing Company
31.	Ducting System	3/6	<p>Objectives:</p> <p>Students are able to discern air conditioning principle and students are able to design/draw ship air conditioning system.</p> <p>Course Topics:</p> <p><u>Class:</u></p> <ol style="list-style-type: none"> 1. Air characteristic 2. Air conditioning Principle 3. Air conditioning 4. Cooling load calculation (sensible & latent load) 5. Air Conditioning system 6. Water chiller & refrigeration system 7. Air quantity estimation 8. Marine air conditioning and ventilation system 9. Ducting design 10. Ducting system & auxiliary equipment <p><u>Workshop:</u></p> <ol style="list-style-type: none"> 1. Rectangular Ducting 2. (Straight duct 3. rectangular elbow, 4. rectangular diffuser, rectangular take off) 5. Round ducting 6. Duct lofting and construction 7. Ducting network design (Ventilation & Air conditioning)

			References: <ul style="list-style-type: none"> - Harrington, Marine Engineering. SNAME - Carrier, Air Conditioning Hand Book, Mc, Graw Hill Co., New York - Mustaghfirin, M.A, Hand Out Sistem Saluran Udara PPNS 2000
32.	Computer Numeric Control (CNC)	2/4	Objectives: Students are able to discern the various codes, addresses, and parameters in CNC milling, then student able to input into a CNC program. Furthermore, students are able to practice on the computer and CNC machines, and able to transfer program from the computer to engine/ equipment. Course Topics: <ol style="list-style-type: none"> 1. Set up work piece & cutting tool 2. Write CNC program 3. Computer simulation program and CNC Equipment 4. CADD-CAM 5. Transfer program from computer to CNC Equipment and vice versa. 6. Design simulation at work piece References: <ul style="list-style-type: none"> - DECKEL AG DIALOG II - Koren Y Computer Control of Manufacturing Mc Graw-Hill International Edition 1983 - Puzstal, J & Sava, M Computer Numerical Control, Reston Publishing Company.
33	Control and Monitoring System	1/2	Objectives: Students able to understand control and monitoring system principle , especially pneumatic and hydraulic control system Course Topics: <ol style="list-style-type: none"> 1. Hydraulic and pneumatic equipment circuit 2. Hydraulic and pneumatic symbols 3. Hydraulic and pneumatic Elements 4. Pneumatic and hydraulic control system. 5. Measurement method 6. Ship performance and conditioning monitoring system 7. Monitoring system optimization References: <ul style="list-style-type: none"> - Harrington, Marine Engineering, SNAME 1977 - Ernest C. Fitch, Fluid Power and Control System, McGraw-Hill Book Company, New York, 1966 - Essligen, Fundamentals of Pneumatik Control Engineering, Festo didactic, 1987 - Jhon Pippemger & Tyler Hicks, Industrial Hydraulics, McGraw-Hill Book Co, Singapore, 1985 - JP Holman, Metode Pengukuran Teknik - Diesel Engine Monitoring Systems, British Petroleum. - Rao, S.S. Optimization, Theory and Application, Willey Eastern Limited.
34.	Drawing Assignment of Shaft, Stern tube & Propeller	2/4	Objectives: Students are able to discern Shaft, Stern Tube and Propeller Designing Principle refer to standard code Course Topics: <ol style="list-style-type: none"> 1. Ship resistance review.

			<ol style="list-style-type: none"> 2. Propeller system review 3. Engine and propeller selection Review 4. Determine diameter of propeller shaft 5. Design coupling and restraint's bolt and nut 6. Design propeller stern tube 7. Drawing stern tube and propeller <p>References:</p> <ul style="list-style-type: none"> - Peraturan Klasifikasi ; Machinery & Hull Section <p>Principle of Naval Architech, Vol II SNAME</p>
35.	Ship Electrical System	3/6	<p>Objectives: Students are able to discern basic electrical circuit, electrical propulsion engine, and application of electrical installation. Students are able to estimate and calculate electrical power requirement and design electrical wiring diagram in the ship.</p> <p>Course Topics:</p> <p><u>Class:</u></p> <ol style="list-style-type: none"> 1. AC & DC electrical circuit 2. AC & DC Electromotor 3. Motor Power 4. Alternator (generator) 3 phase 5. Synchronizes, parallel 6. Power distribution 7. Ship Lighting System 8. Basic electronic equipment <p><u>Laboratory:</u></p> <ol style="list-style-type: none"> 1. Electric Load distribution 2. Block Diagram, wiring diagram & Single line diagram 3. Lighting load 4. Power generator capacity 5. Accumulator capacity 6. Cable installation 7. 1 phase & 3 phase Electric motor 8. DC Electromotor 9. AC & DC power generator 10. 1 phase & 3 phase Transformator <p>References:</p> <ul style="list-style-type: none"> - Zahal, Teori Dasar Listrik, ITB - Theraja, B.L., Electrical Engineering, Mcgraw Hill - Watson, G.O. Marine Electrical Practice - Herbert Frisch, Electronic, 1975 - Lurch, N.E Fundamentals Of Electronics - Setiawan E. Instalasi Listrik Arus Kuat - Modul praktikum mesin-mesin listrik PPNS-ITS
36.	On the Job Training	15/40	<p>Objectives: Students are able to apply science and technology concepts industry field. So students will have real and applied industrial experience. At final, students are able to design, analyze, evaluate and solve a real problem in industry and marine industry.</p>
37.	Religion Islamic Values	2/2	<p>Objectives: Students are able to understand, recognize and belief about Muslim religion and are able to understand and belief the truth of Islam and apply it in daily life by using Al-Quran guidance and <i>Sunnah</i> of the prophet Muhammad SAW.</p>

		<p>Course Topics:</p> <ol style="list-style-type: none"> 1. Role of Religion in life 2. Concept of Islam about God, faerie, holy Quran 3. Islam Rule 4. Universe Creation 5. Human in Moslem 6. Self Consecration 7. Personal Education and Social 8. Moral 9. Family and Moslem Society 10. Science and Technology in Islam <p>References:</p> <ul style="list-style-type: none"> - Department of Religion, Al-Quran and the translation, Bumi Restu Press., Jakarta, 1971 - Religion Lecturers of ITS, Basic of Moslem Religion - Nasution, H., Islam in Several Aspects, UI Press, Jakarta 1979. <p>Syaifudin E.A., The Vision of Islam, Pustaka, Jakarta 1985</p>
Catholic	2/2	<p>Objectives: Increasing understanding concept of belief in Church. Life in Christ and society in developing attitude and mental of Catholic person which can prove themselves in Indonesian society to reflect their belief.</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. Belief in Church 2. Church as Safety Sacrament 3. Church Decision 4. Human Responsibility as the member of Church 5. Church Service 6. Leadership in Church <p>References:</p> <ul style="list-style-type: none"> - R. Hadiwiyono S.Y., Fostering Faith Church, Dopken MAWI, Jakarta - Riberu, Y., Revelation For The Revealer, Luseat, Jakarta - Yakobs. T., Dynamics Church, Canisius Foundation, Jogjakarta - Budiyo, A.P., Comprehend Scriptures In group with 30 people, Canisius Foundation, Jogjakarta
Protestant	2/2	<p>Objectives: Equip students to be able to grow and establish itself fully as a human person a new creation in Jesus Christ, fellow humans and the environment. Because it is willing to devote his entire life and all science for the benefit of fellow at all aspects and fields of life where she served for the honor and glory of God</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. Religious consciousness in human life 2. The meaning of faith (confession, revelation, testimony) 3. Phenomologi religions (similarities and differences in understanding) 4. Religion and Pancasila 5. Man as the image of God (man responsible, man as bearer of the mandate of God) 6. Human relations and science 7. Meaning of God's law and calls for the life of society and nation <p>References:</p>

			<ul style="list-style-type: none"> - Indonesian Bible Institute, Bible - Dahler, F,R., Religious Issues - Dr. Honig, Religion Science - Dr. Bleeker, Meeting of World Religions - Dr. Schuman, Olaf, Dialogue Inter-religious community - Dr. Walter Lempp, Responsible Students - Dr. Walter Lempp, Building Human Development - Dr. H.Hadiwijono, Christian Faith - Brownly, M, Ethical Decision Making - Dr. DC. Mulder, Christian Faith and Science
	Hinduism	2/2	<p>Objectives: Religious understanding and it's appreciation, strengthen confidence, faith and worship of a Hindus to Sang Hyang Widhi Wasa / God Almighty so that they can control their thinking, speaking and acting in his devotion to the Nation and the 1945 Constitution to support National development program.</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. History of Hinduism 2. The sources of Hinduism gospel 3. Scope 4. Mawa Darsana 5. Tantrayaman 6. Panca Siadha Tattwa 7. Watur Marga Yoga pranata Sosial 8. Kala Dharma 9. Dhamada 10. Budhisatewa dan the concept of religious harmony
	Buddhism	2/2	<p>Objectives: Understanding. appreciate and practice of the precepts belief in Almighty God, Dharma and services to strengthen faith (Soddha) in maintaining the survival of religion, nation and state based on Pancasila and the Constitution of 1945.</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. The nature of God Almighty 2. The conception of religious harmony 3. Budhisatwa dan Buddha <p>References:</p> <ul style="list-style-type: none"> - Dipuhtera, O., The image of Buddhism in the philosophy of Pancasila - The Ministry of Religion, P4 Guidelines for Buddhism <p>Project Procurement Buddhist Scriptures, Dharmapada</p>
38.	Advanced English	2/4	<p>Objectives: Students are able to use English to present science article, answering and responding question correctly. The students are obliged to get minimum 450 for TOEFL as the requirement of graduation.</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. Writing articles 2. Presentation 3. Argumentation 4. Respond/answer the question in seminar session 5. Job interview 6. TOEFL preparation <p>References:</p> <ul style="list-style-type: none"> - Barron TOEFL

			<ul style="list-style-type: none"> - Longman, TOEFL - Hutchinson T. Interface - Nethold, K, Understanding Technical English
39.	Special Ship System	1/2	<p>Objectives: Students understand the basic design and characteristics of a particular vessel system in accordance with applicable regulations.</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. Tanker <ul style="list-style-type: none"> - Inert Gas System - Crude Oil Washing - Fire Fighting System 2. Fast patrol Boat <ul style="list-style-type: none"> - Ship propulsion system - Specific characteristic of ship resistance 3. Tug Boat <ul style="list-style-type: none"> - Towing/Bollard Pull 4. Fishing Vessels <ul style="list-style-type: none"> - Types of fishing vessel - Fish catching methods - cold storage <p>References:</p> <ul style="list-style-type: none"> - Classification Regulations - IMO regulations - Brady. E.M. Tugs. Towboat and Towing, Cornell Maritime Press Inc., 1967 - Design of Small Fishing Vessel, FAO - Fishing Book of World
40.	Project Work	6/12	<p>Objectives: Students are able to apply science and technology concepts and internship industrial experience so they are able to design, analyze, evaluate and solve problems in various aspects of engineering and marine systems.</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. Idea, topic & background of project work 2. Scientific writing 3. Arrange project work proposal 4. Seminar 5. Methodology 6. Design, analysis, evaluation and problem solving at various aspects of engineering and marine systems. 7. Final project work reporting 8. Performance test 9. Oral presentation <p>References:</p> <ul style="list-style-type: none"> - All subjects
41.	Entrepreneurship	2/4	<p>Objectives: Students are able to discern Entrepreneurship principle and apply it correctly</p> <p>Course Topics:</p> <ol style="list-style-type: none"> 1. Entrepreneurship principle 2. To arise the Entrepreneurship skill 3. Entrepreneurship strategy, Idea, creativity 4. Planning and business management. 5. Planning and capital management.

			6. Project feasibility 7. Internship and marketing 8. Entrepreneurship project References: - Pinchot G. Kasip, Z. Intrapreneuring - Drucker. P.F. Inovasi dan Kewiraswastaan Wijandi. S. Pengantar Kewirausahaan
42.	Engine Room Layout	4/8	Objectives: Students are able to design a ship propulsion systems, equipments and shipboard system as well its piping arrangements, and to set (lay-out) in engine room according to class regulations. Course Topics: 1. General Arrangement 2. Engine Room Lay-out 3. Engine & propeller Selection & Matching 4. Foul Oil System 5. Lubricating Oil System 6. ME and AE Cooling Water System 7. Starting System 8. General shipboard system (ballast, bilge, fire) 9. Domestic Sanitary System 10. Cargo Oil System (for Tanker) 11. Generator Set Selection References: - Taylor, D. A Introduction to Marine Engineering Butterworth, 1983 - Harrington, L.R. Marine Engineering, SNAME, New York, 1977 - Class Regulations -
43.	Shipyard Management	2/4	Objectives: Students are able to discern and apply shipyard management for handling new shipbuilding construction, maintenance and repair work. Course Topics: <u>Class :</u> 1. Scheduling 2. Bar chart 3. Network Planning 4. Human resources and facility allocation 5. Manpower histogram 6. To control project 7. Microsoft Office Project <u>Assignment :</u> 1. Manage resources for handling new shipbuilding project 2. Manage resources for maintenance and repair of ship bulkhead 3. Manage resource management for maintenance and repair of propeller. 4. Manage resources for yearly auditing and survey References: - Dormidontov, V.K. Shipbuilding Technology - Benkovsky, D., Technology of Ship Repairing - Peraturan Klasifikasi - SNAME, " Shipbuilding Technology"

