# University of Mumbai



## No. UG/09 of 2020-21

#### CIRCULAR:-

Attention of the Principals of the Affiliated Colleges and Directors of the recognized Institutions in Science & Technology Faculty is invited to this office circular No.UG/76 of 2015-16, dated 15<sup>th</sup> September, 2015 relating to the revised syllabus as per the (CBSGS) for the Second Year (Sem. III & IV) of B. Sc Programme in Nautical Science.

They are hereby informed that the recommendations made by the Ad-hoc Board of Studies in Nautical Science at its online meeting held on 15<sup>th</sup> April, 2020 <u>vide</u> item No.1 and subsequently made by the Board of Deans at its meeting held on 26<sup>th</sup> June, 2020 <u>vide</u> item No. 13 (5) have been accepted by the Academic Council at its meeting held on 23<sup>rd</sup> July, 2020 <u>vide</u> item No. 4.70 and that in accordance therewith, to the revised syllabus as per the (CBCS) of S.Y. B.Sc. Nautical Science (Sem – III & IV) has been brought into force with effect from the academic year 2020-21 accordingly. (The same is available on the University's website <u>www.mu.ac.in</u>).

MUMBAI – 400 032

(Dr. Vinod Pati I/c REGISTRAR

To

The Principals of the affiliated Colleges and Directors of the recognized Institutions in Science & Technology Faculty. (Circular No. UG/334 of 2017-18 dated 9<sup>th</sup> January, 2018.)

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#### A.C/4.70/23/07/2020

No. UG/ 05 -A of 2020-21 MUMBAI-400 032 Copy forwarded with Compliments for information to:-

11 November, 2020

- 1) The Dean, Faculty of Science & Technology,
- 2) The Chairman, Ad-hoc sBoard of Studies in Nautical Science,
- 3) The Director, Board of Examinations and Evaluation,
- 4) The Director, Board of Students Development,
- 5) The Co-ordinator, University Computerization Centre,

(Dr. Vinod Patil) I/c REGISTRAR

Copy to :-

- 1. The Director of Board of Student Development.,
- 2. The Deputy Registrar (Eligibility and Migration Section)
- 3. The Director of Students Welfare,
- 4. The Executive Secretary to the to the Vice-Chancellor,
- 5. The Pro-Vice-Chancellor
- 6. The Registrar and
- 7 The Assistant Registrar, Administrative sub-centers, Ratnagiri, Thane & Kalyan, for information.
- 1. The Director of Board of Examinations and Evaluation
- 2. The Finance and Accounts Officers
- **3. Record Section**
- 4. Publications Section
- 5. The Deputy Registrar, Enrolment, Eligibility and Migration Section
- 6. The Deputy Registrar (Accounts Section), Vidyanagari
- 7. The Deputy Registrar, Affiliation Section
- 8. The Professor-cum- Director, Institute of Distance and Open Learning Education,
- 9. The Director University Computer Center (IDE Building), Vidyanagari,
- 10. The Deputy Registrar (Special Cell),
- 11. The Deputy Registrar, (PRO)
- 12. The Deputy Registrar, Academic Authorities Unit (1 copies) and
- 13. The Assistant Registrar, Executive Authorities Unit

They are requested to treat this as action taken report on the concerned resolution adopted by the Academic Council referred to in the above circular and that on separate Action Taken Report will be sent in this connection.

- 1. The Assistant Registrar Constituent Colleges Unit
- 2. BUCTU
- 3. The Deputy Accountant, Unit V
- 4. The In-charge Director, Centralize Computing Facility
- 5. The Receptionist
- 6. The Telephone Operator
- 7. The Secretary MUASA
- 8. The Superintendent, Post-Graduate Section
- 9. The Superintendent, Thesis Section

for information.

AC - 23<sup>rd</sup>July, 2020

Item No. 4.70



### AC – 23<sup>rd</sup>July, 2020 Item No.<u>4.70</u>

#### **UNIVERSITY OF MUMBAI**



#### **Syllabus for Approval**

Sr. No.	Heading	Particulars
1.	Title of the Program	B.Sc. (Nautical Science)
2.	Eligibility for Admission	<ul> <li>Indian National</li> <li>HSC or equivalent Certificate</li> <li>Mark Sheet showing minimum 60% marks in PCM subjects in HSC (10+2).</li> <li>Minimum 50% Marks in English language in SSC or HSC</li> <li>Age not more than 25 yrs on the date of</li> </ul>
		<ul> <li>commencement of course. Age relaxation as per govt. Rules.</li> <li>Medical Fitness Certificate from a Doctor approved by Director General of Shipping</li> <li>Eye Sight Test Certificate -6x6 both eyes and no colour blindness from any DG approved doctor</li> </ul>
3.	Entrance Examination	Should have passed CET conducted by IMU
4.	Ordinances / Regulations (if any)	Time to time issued by university.
5.	No. of Years / Semesters	3 Years / 6 Semesters.
6.	Level	U.G.
7.	Pattern	Semester
8.	Status	Revised
9.	To be implemented from Academic Year	From Academic Year 2020-21 (w.e.f. Academic Year 2020-21 onwards.)

Date:

VSummyh.

Signature:

Name BOS Chairperson :Capt. Vinod Suryavanshi

#### **Cover Page**

#### UNIVERSITY OF MUMBAI

#### Syllabus for Approval

- 1. Title of the Program:-B.Sc. (Nautical Science) Program Code: -42300006
- 2. Preamble / Scope:-

#### PREAMBLE

This course is an integral part of the overall shipboard structured training programme for the prospective navigating officer and guidelines set by DG Shipping of India. The course is residential in nature and of Three-year duration comprising of six semesters of six months each.

The prospective navigating officer will be trained for 12 months onboard ship in practical application of the theory learnt. Thereafter at the end of this structured programme, a "contact programme" for four months (optional) may be conducted at any of the DG approved Institute to prepare the Cadets for a written & oral examination conducted by the Director General of Shipping, Ministry of Surface Transport, government of India.

On successful completion of the Programme a Cadet will be awarded a degree of B.Sc. (Nautical Science) by University of Mumbai and a Certificate of Competency by Govt. of India, which will enable him to become an officer on a merchant ship.

A Pre-Sea Navigating Officer Cadet successfully completing the three years programme would acquire basic knowledge and understanding of the types of merchant ships, ship operations, types of goods carried by ships, shipping trade, and a foundation in the basic principles of navigation and environmental science.

The course is designed to impart:

- ~ Theory and practice of seamanship and ship knowledge.
- ~ Good foundation in principles of navigation and introduction to celestial Navigation.
- ~ Practical knowledge of chart work and cargo work.

~ Detailed study of atmosphere and use of meteorological instruments in connection with weather reporting.

~ Knowledge of ship construction and ship stability.

~ Regular practice in Morse code signaling, in addition to International Code of Signals and use of VHF and R/T.

- ~ Practical training in handling a lifeboat and motorboat.
- ~ One Project related to shipping industry to be under taken.
- ~ Study of environmental protection with reference to MARPOL 73/78 as amended.
- ~ Study of various SCTW courses.
- ~ Study of basic Marine Engineering and drawing.

Practical Training in carpentry shop, plumbing shop, machine shop, electrical shop and maintenance workshop including Electric Arc welding and Gas welding, Hydraulics, Pneumatics and Diesel Engine maintenance.

#### Objective

This course is designed to assist a prospective navigating officer in achieving the minimum standards of competence for officers in charge of navigational watch on ships of 500 GT or more as specified in Regulation II/1, Table A-1 of STCW 1978, as amended.

This course is aimed at preparing the trainee to develop a right attitude towards tasks and duties assigned to him during the on-board training programme in learning the job of being a ship's officer and in achieving the overall standard of competence as required.

#### Salient features

- As under the preview of D.G Shipping, it's a fully residential course
- Students' daily routine starts from 6:00 o'clock in the morning till 9:00 in the evening, as per the requirement on board ships
- Morning exercise, parade, evening sports and 1 hour of self study classes 6 days a week is the part of daily routine.
- Trekking, dock visits, ship visits is a part of curriculum apart from other extracurricular and sports activities

**Note:** The conduct of STCW courses is strictly conducted as per the guidelines of D.G Shipping; who in turn being directed by International Maritime Organization. These guidelines may be modified/ changed time to time as instructed by D.G Shipping through its training circulars or as the case may be.

1)	Capt. VinodSuryavanshi	Convener/BOS Chairperson
2)	Capt. (Dr.) Ashutosh Apandkar	Invitee/Ex BOS Chairperson
3)	Capt. Mahadeo Makane	Member (Teacher)
4)	Capt. LaxmanDubey	Member (Teacher)
5)	Capt. SandeepG. Bhatnagar	Member (Teacher)
6)	Capt. A.P. Singh	Member (Teacher)

#### **Syllabus Committee Members**

#### 3. Eligibility:-

- Indian National
- HSC or equivalent Certificate
- Mark Sheet showing minimum 60% marks in PCM subjects in HSC (10+2).
- Minimum 50% Marks in English language either in SSC or HSC
- Age not more than 25 yrs for HSC students on the date of commencement of course. Age relaxation as per govt. Rules.
- Medical Fitness Certificate from a Doctor approved by Director General of Shipping
- Eye Sight Test Certificate -6x6 both eyes and no colour blindness from a DG approved doctor

# B.Sc. in Nautical Science: Theory/Practical: 16 Weeks (15 weeks for lectures/practical & one week for semester end examination) Semester –III

Course	Title of the Course	Per Wook		Per Somostor		Marks		Credit		Total
Code	The of the Course	vve L	P	Sem L	P	ТН	PR	S L	Р	1 otai
	Core Course									
	Navigation –II	3	1	45	15	100	50			
USNSc302	Voyage Planning &Collision Prevention– II	2	2	30	30	100	50	3	2	5
USNSc303	Ship Operation Technology-II	3	1	45	15	100	50			
	Bridge Procedure & Legal Knowledge	3	1	45	15	100	50	3	2	5
	Naval Architecture-II	3		45		100		]		
	AECC – Ability Enl	nance	emen	t Con	npulso	ry Cou	irse			
LIGNG 201	Applied Mathematics- III	4		60		100			1	4
051150301	Nautical Physics & Electronics-III	4	2	60	30	100	50	3	1	4
	SEC - Skill	l Enh	ance	ment	Cours	e				
USNSc301	Computer Science	3	1	45	15	100	50	1	1	2
	DSE – Elective: Discipline Specific									
USNSc304	Environmental Science-II	3	1	45	15	100	50	2	2	4
USNSc304	MarineEngineering&ControlSystem - II	3	1	45	15	100	50	2		4
Total		31	10	465	150	1000	400	12	8	20

#### **Semester IV**

Course Code	Title of the Course	Per	Wee	ek	Per Sem r	este	Mar	ks	Cre s	edit	Total
		L	]	Р	L	Р	TH	PR	L	Р	
		Cor	e C	Cou	rse						
	Navigation –II	3		1	45	15	100	50			
USNSc402	Voyage Plannin &Collision Prevention– II	g 2	/	2	30	30	100	50	3	2	5
USNSc403	Ship Operatio Technology-II	n 3		1	45	15	100	50			
	Bridge Procedure d Legal Knowledge	& 3		1	45	15	100	50	3	2	5
	Naval Architecture-II	3			45		100				
	AECC – Ability F	Enhar	cer	nen	t Cor	npuls	ory C	Course			
USNS-401	Applied Mathematics IV	8- 4			60		100		2	1	1
051150401	Nautical Physics & Electronics-IV	& 4		2	60	30	100	50	3	1	4
	SEC - SI	kill E	nha	nce	ement	: Cou	rse				
USNSc401	Computer Science	3		1	45	15	100	50	1	1	2
DSE – Elective: Discipline Specific											
USNSc404	Environmental Science-II	3		1	45	15	100	50	2	2	1
USNSc404	MarineEngineerin&ControlSystem - II	g 3		1	45	15	100	50	2	2	+
Total		31	1	10	465	150	1000	400	12	8	20

**Objective:** - This subject exposes the students to Computer Science, Applied Mathematics & Nautical Physics

Unit	Topics/Sub Topics	Theory	Practical
No.			
Unit I	Bessel Functions, Legendre Polynominals& PartialDifferential Equations:	20 Hrs.	
	Relations between Laplace equation and		
	Bessel'sdifferential equation, Its solution by series		
	methods, Besselfunctions of first and second kind,		
	Recurrence relations for J(x),		
	Relation between Laplace equation and Legendre		
	differential equation, Itssolution by series		
	methods, Recurrence relations for		
	Pn(x), Rodriguez's formula for $P(x)$ ,		
	Partial differential equation governing		
	I ransverse Vibration of an alastic string its solution using		
	Fourier Series Vibrations of a rectangular and		
	circular membrane Heatequation steady – state		
	configuration for heat flow and anale equation in		
	two and three dimensions. Variableheat flow in		
	one dimension.		
Unit II	Laplace Transforms: Function of bounded variation (Statement only),	20 Hrs.	
	Laplace $f_{1}$ the formula $f_{1}$ the formula $f_{2}$ the formu		
	transforms of 1, t <sup><math>n</math></sup> , e <sup><math>n</math></sup> , sin (at), cos (at), sin n (at) Cos h(at) orf (t) Shifting properties		
	Expressions (with Proofs) for ·		
	(i) $L\{t^nf(t)\}$ (ii) $L\{f(t)\}/T$ (iii) $L\{f^t(u)du\}(iv)$		
	$\frac{L\{d^{n}f(t)\}}{dt^{n}} = \frac{L\{d^{n}f(t)\}}{dt^{n}}$		
	Evaluation of inverse Laplace Transforms, partial		
	fractionmethods, convolution theorem.		
	problems involving ordinary differential equations		
	with onedependent variable.		

Contents of syllabus for USNSC 301 – APPLIED MATHEMATICS -III Semester III

Unit III	Complex Variables:	20 Hrs.
	Functions of complex variable. Continuity (only	
	statement)derivability of a function analytic.	
	Regular function. Necessary conditions for f (z) to	
	be analytic. (Statement ofsufficient conditions).	
	Cauchy Riemann equation in polarco-ordinates.	
	Harmonic functions, Orthogonal	
	trajectories. Analytical and Milne – Thomson	
	method to find $f(z)$ from its real or imaginary parts.	
	Integration of complex functions, Cauchy's integral	
	theorem for simply connected regions, Cauchy's	
	integral formula, Taylor's and Laurent's expansion,	
	Zeros, Singularities, poles, residue at	
	isolated singularity and its evaluation. Residue	
	theorem, itsapplication to evaluate real integrals.	

## Contents of syllabus for USNSC 401 – APPLIED MATHEMATICS - IV Semester IV

Unit No.	Topics/Sub Topics	Theory	Practical
Unit I	Numerical Methods:	20 Hrs.	
	Newton– Raphson method, bisection method. Finite		
	differences offirst and higher order, forward,		
	backward differences, difference tables, shift		
	operator – E. Interpolation: linear and quadratic		
	interpolation, Newton's forward and backward		
	difference interpolation formulas, Langrangian		
	interpolation, Solutions to systems of linear		
	algebraic equations: Gause elimination, Gauss-		
	Jordan method, Gauss-Seidel iteration Jacobi		
	iteration.		
Unit II	Matrices:	20 Hrs.	
	matrix Elementary transformations rank of a matrix		
	Reduction to a normal form. Linear programming-		
	problems and applications. Characteristic		
	polynomial. Cayley Hamilton theorem. Functions of		
	matrix.Ouadratic forms. Orthogonal.		
Unit III	Statistics:	20 Hrs.	
	Frequency distribution, Measures of central		
	tendency; Mean, Median and Mode, Measures of		
	variability, Range, Percentiles, Variance, Standard		

Deviation, Skewness, Moments, Discrete random variables and their probability distributions, Binomial and Poisson's distributions, coefficient of Correlation Lines of Regression – Bank Correlation	
Correlation, Lines of Regression – Rank Correlation	

\*There will be continuous assessment of skills being acquired through class work, periodic assignments / project works / tests.

# NOTE: A candidate has to secure minimum percentage /grade: 40 % as per Training Circular No 4 of 2005 by DG Shipping, Govt of India

#### **Reference Books:-**

- 1. A Text book for applied mathematics
- 2. A Text Book of Matrices
- 3. Mathematical Statistics
- 4. Statistics in Schaum's Series
- 5. Probability& Statistics for engineers
- 6. Higher Engineering Mathematics
- 7. Numerical methods for engineers
- 8. Operation Research, An introduction
- 9. Operation research methods & Problems
- 10. Linear Programming

Wartikar P.N. &WartikarJ.N. Shanti Narayan J.N.Kapur, H.C. Saxena Murray R.Spiegal Myers Dr. B.S. Grewal S.K. Gupta H.A. Taha Sasieni, Yaspan, Friedman G. Hadley

# Contents of syllabus for USNSC301 – NAUTICAL PHYSICS& ELECTRONICS - III

**Semester III Topics/Sub Topics Practical** Unit No. Theory Unit I 15 Hrs. **Review of a. c. circuits:** Self inductance. inductive reactance, purely inductive circuit. a.c. through resistance and inductance. choke. numerical problems. Capacitance, capacitive reactance, purely capacitive circuit, a.c. through capacitance, and resistance, numerical problems. Impedance, admittance, a. c. through L-C-R circuit, series and parallel resonant circuits, power and power factor in a. c. circuits, numerical problems. **Electrical Bridge Circuits:** 

	Bridge circuits, Wheatstone Bridge, Maxwell		
	Inductance and Capacitance Bridges. De Sauty		
	Bridge, Schering Bridge, Hay's Bridge, Definition		
	of O of coil, Applied Problems.		
	Instrumentation:		
	Calibration, Accuracy, Precision, Methods of		
	measurement of temperature, pressure, Fluid flow,		
	venturi tube, sound level meter, thermister and its		
	application as heat sensors, transducers.		
Unit II	Modulation concepts:	25 Hrs.	
	Amplitude modulation, modulation index, power distribution in A. M. wave, linear modulation, square law modulation, diode modulator, transistor modulator, balance modulator, single side band generation, suppression of carrier. Frequency and phase modulation, F.M. wave, modulation index, side band in F. M., Reactance Modulator. Comparison of AM, FM & PM <b>Demodulation Techniques:</b> Demodulation of A.M. waves, diode detector,		
	transistor modulator. detection efficiency.		
	amplitude distortion. Demodulation of FM waves.		
	frequency demodulator.		
	<b>Digital Communications:</b> Types of pulse modulation, generation and demodulation of Pulse Amplitude Modulation (PAM) waves, distortion in PAM, Pulse Duration (width) modulation (PWM or PDM). Pulse Code Modulation (PCM), generations and demodulation of PCM, direct FM transmitter, Armstrong FM system, mobile communication systems.		
Unit III	Wave propagation:	20 Hrs	
	Basic electromagnetic spectrum, mechanism of		
	wave propagation, field strength, propagation		
	through troposphere, propagation models, radio		
	horizon, troposphere monitoring techniques, sky –		
	wave propagation, ionosphere, microwave links and		
	other communication links, noise in communication		
	systems.		
	Radio receivers & Transmitters:		
	Straight and regenerative receivers, turned RF		
	receivers, superheterodyne receivers, AM receivers,		
	stereo FM multiplexed reception, noise		
	consideration, AM transmitter, FM transmitter		

	Antennas:	
	Resonant antenna, antenna gain, radiation	
	resistance, impedance matching, feeders, resonant	
	line feed, grounded antennas, higher frequency	
	antennas, dipole arrays, Yagi – Uda antenna,	
	Rhombic antenna, microwave antenna, active	
	antenna, horn antenna, dielectric antenna.	
	Radar Communication:	
	Elements of radar system, radar range, limitations	
	of radar, radar altimeters and beacons, interrogating	
	radars, Instrument Landing System (ILS), Visual	
	VHF Omni Range (VOR), Tactical Air Navigation	
	(TACAN), Radio Direction Finding (RDF).	
	Satellite Communication:	
	Satellite links, eclipses, orbits and inclination,	
	satellite construction, communication frequencies,	
	domestic satellites telemetry	
	domostic sutenites, teremetry.	
Practical	EXPERIMENTS	30 Hrs.
Practical	<b>EXPERIMENTS</b> 1. Use of a C.R.O. –	30 Hrs.
Practical	<b>EXPERIMENTS</b> 1. Use of a C.R.O. – measurement of voltage,	30 Hrs.
Practical	EXPERIMENTS 1. Use of a C.R.O. – measurement of voltage, frequency, time & phase	30 Hrs.
Practical	EXPERIMENTS 1. Use of a C.R.O. – measurement of voltage, frequency, time & phase shift.	30 Hrs.
Practical	<ul> <li>EXPERIMENTS</li> <li>1. Use of a C.R.O. – measurement of voltage, frequency, time &amp; phase shift.</li> <li>2. Low pass, High pass filters (R-C)</li> </ul>	30 Hrs.
Practical	<ul> <li>EXPERIMENTS</li> <li>1. Use of a C.R.O. – measurement of voltage, frequency, time &amp; phase shift.</li> <li>2. Low pass, High pass filters (R-C)</li> <li>3. Band pass &amp; Band stop filters (R-C)</li> </ul>	30 Hrs.
Practical	<ul> <li>EXPERIMENTS</li> <li>1. Use of a C.R.O. – measurement of voltage, frequency, time &amp; phase shift.</li> <li>2. Low pass, High pass filters (R-C)</li> <li>3. Band pass &amp; Band stop filters (R-C)</li> <li>4. Series &amp; Parallel resonance (R-C-L) – Q factor</li> </ul>	30 Hrs.
Practical	<ul> <li>EXPERIMENTS</li> <li>1. Use of a C.R.O. – measurement of voltage, frequency, time &amp; phase shift.</li> <li>2. Low pass, High pass filters (R-C)</li> <li>3. Band pass &amp; Band stop filters (R-C)</li> <li>4. Series &amp; Parallel resonance (R-C-L) – Q factor</li> <li>5. Class A Power Amplifier</li> </ul>	30 Hrs.
Practical	<ul> <li>EXPERIMENTS</li> <li>1. Use of a C.R.O. – measurement of voltage, frequency, time &amp; phase shift.</li> <li>2. Low pass, High pass filters (R-C)</li> <li>3. Band pass &amp; Band stop filters (R-C)</li> <li>4. Series &amp; Parallel resonance (R-C-L) – Q factor</li> <li>5. Class A Power Amplifier</li> <li>6. Amplitude Modulation</li> </ul>	30 Hrs.
Practical	<ul> <li>EXPERIMENTS</li> <li>1. Use of a C.R.O. – measurement of voltage, frequency, time &amp; phase shift.</li> <li>2. Low pass, High pass filters (R-C)</li> <li>3. Band pass &amp; Band stop filters (R-C)</li> <li>4. Series &amp; Parallel resonance (R-C-L) – Q factor</li> <li>5. Class A Power Amplifier</li> <li>6. Amplitude Modulation</li> <li>7. Frequency Modulation</li> </ul>	30 Hrs.
Practical	<ul> <li>EXPERIMENTS</li> <li>1. Use of a C.R.O. – measurement of voltage, frequency, time &amp; phase shift.</li> <li>2. Low pass, High pass filters (R-C)</li> <li>3. Band pass &amp; Band stop filters (R-C)</li> <li>4. Series &amp; Parallel resonance (R-C-L) – Q factor</li> <li>5. Class A Power Amplifier</li> <li>6. Amplitude Modulation</li> <li>7. Frequency Modulation</li> <li>8. Pulse Code Modulation – Generator &amp;</li> </ul>	30 Hrs.
Practical	<ul> <li>EXPERIMENTS</li> <li>1. Use of a C.R.O. – measurement of voltage, frequency, time &amp; phase shift.</li> <li>2. Low pass, High pass filters (R-C)</li> <li>3. Band pass &amp; Band stop filters (R-C)</li> <li>4. Series &amp; Parallel resonance (R-C-L) – Q factor</li> <li>5. Class A Power Amplifier</li> <li>6. Amplitude Modulation</li> <li>7. Frequency Modulation</li> <li>8. Pulse Code Modulation – Generator &amp; Demodulator</li> </ul>	30 Hrs.
Practical	<ul> <li>EXPERIMENTS</li> <li>1. Use of a C.R.O. – measurement of voltage, frequency, time &amp; phase shift.</li> <li>2. Low pass, High pass filters (R-C)</li> <li>3. Band pass &amp; Band stop filters (R-C)</li> <li>4. Series &amp; Parallel resonance (R-C-L) – Q factor</li> <li>5. Class A Power Amplifier</li> <li>6. Amplitude Modulation</li> <li>7. Frequency Modulation</li> <li>8. Pulse Code Modulation – Generator &amp; Demodulator</li> <li>9. Study of PLL</li> </ul>	30 Hrs.
Practical	<ul> <li>EXPERIMENTS</li> <li>1. Use of a C.R.O. – measurement of voltage, frequency, time &amp; phase shift.</li> <li>2. Low pass, High pass filters (R-C)</li> <li>3. Band pass &amp; Band stop filters (R-C)</li> <li>4. Series &amp; Parallel resonance (R-C-L) – Q factor</li> <li>5. Class A Power Amplifier</li> <li>6. Amplitude Modulation</li> <li>7. Frequency Modulation</li> <li>8. Pulse Code Modulation – Generator &amp; Demodulator</li> <li>9. Study of PLL</li> <li>10.Diode as a peak detector for A.M. &amp; F.M.</li> </ul>	30 Hrs.
Practical	<ul> <li>EXPERIMENTS</li> <li>1. Use of a C.R.O. – measurement of voltage, frequency, time &amp; phase shift.</li> <li>2. Low pass, High pass filters (R-C)</li> <li>3. Band pass &amp; Band stop filters (R-C)</li> <li>4. Series &amp; Parallel resonance (R-C-L) – Q factor</li> <li>5. Class A Power Amplifier</li> <li>6. Amplitude Modulation</li> <li>7. Frequency Modulation</li> <li>8. Pulse Code Modulation – Generator &amp; Demodulator</li> <li>9. Study of PLL</li> <li>10.Diode as a peak detector for A.M. &amp; F.M.</li> <li>NOTE: A minimum of 8 experiments are</li> </ul>	30 Hrs.

# Contents of syllabus for USNSC401 – NAUTICAL PHYSICS& ELECRONICS - IV

Semester IV

Unit No.	Topics/Sub Topics	Theory	Practical
Unit I	Network Theorems and its applications:	25 Hrs.	
	Kirchoff's Law, Classification of Network		
	elements, Constant Voltage and Current Source,		
	Nodal Analysis, Thevenin'sTheorem, Maxwell		
	Theorem, Superposition Theorem, Norton's		
	Theorem, Millman' Theorem, Maximum power		
	transfer Theorem, Applied Numericals.		
	ANALOG CIRCUITS		
	Transistor Biasing: Operating point, Base bias		
	(Fixed bias), Emitter bias, Voltage divider bias,		
	D.C. load lines, Transistor saturation, Transistor as		
	a switch, Bias Stabilization.Ref.: M:		
	<b>Transistor Amplifier :</b> C.E. amplifier, DC and AC		
	equivalent circuits, small signal operation, voltage		
	gain, current gain, Input and output impedance,		
	Frequency response, DC and AC load lines, Class		
	A operation, Power gain, Decibel Voltage gain, A		
	typical emitter follower circuit Ref.: M: <b>Operational Amplifier:</b> The basis differential and Common Mode Operation, BasicOpamp Specifications, Practical Opamp circuits – SchmittTrigger and square wave generator, Inverting and Non-inverting amplifiers, voltage follower, Summing Amplifier, Difference Amplifier, Integrator and Differentiator. Ref.: BN, M		
Unit II	DIGITAL CIRCUITS	20 Hrs.	
	number System and Logic Gates: Binary numbers, binaryto decimal conversion, Decimal to binary conversion, (Octal and hexadecimal numbers, Binary to Octal and binary – Hexadecimal inter conversion), NOT, OR, AND,NAND, NOR Logic gates, EXOR Gate, arithmetic and data processing circuits (half adder, full adder, multiplexer andde multiplexer), De Morgan's theorems; Boolean algebra, NAND and NOR as a basic building blocks, Logic levels for TTLICs Ref: ML Clocks and Timers:555 times, basic timing		

	astablemultivibrators, Voltage		
	ControlledOscillator (VCO), ramp generator.		
	NAND gate as a clock		
	Ref. ML		
	Flip flops and counters: RS flip flop, Clocked RS		
	flip flop, D flip flop, JK flip-flop, Master Slave		
	concept Schmitt trigger, Flip-Flops used asbinary		
	ripple counters, decade counter.		
	Ref: ML		
Unit III	Feedback Types:Voltage and current feedback,	15 Hrs.	
	Effects of negative feedback on amplifier		
	parameters, derivation only for gain with feedback		
	(No other derivations), typical single transistor		
	circuits for voltage series and current series		
	feedback Oscillator operation Barkhausen criteria		
	BC agaillators phase shift and Wain Bridge (on		
	KC oscillators – phase shift and well bridge (op-		
	amp and transistor), LC oscillators – Colpitts and		
	Hartley (transistor and op-amp), crystal oscillator.		
	Ref:BN:Ch. 18.1 – 18.8 except 18.4		
	Cathode Ray Oscilloscope:Construction,		
	working and basic measurements. Ref: BN.		
	Microprocessors: Digital Computers, Computer		
	Languages, Single Chip Microprocessor		
	architecture and its operations. Memory. Input and		
	Output $(I/O)$ devices Interfacing devices		
	Example of a microcomputer system The 8085		
	microprocessor example of 2025 based		
	microprocessor, example of 8085 – based		
	microcomputer		
	Ref: G: Ch. 1, 2, 4 (except 3.4), 4 (except 4.5,		
	4.6), 5:		
Practical	EXPERIMENTS		30 Hrs.
	1) CE Amplifier – voltage gain, frequency		
	response, plotting A.C. & D.C. load lines.		
	2) Emitter Follower – voltage gain & output		
	resistance.		
	3) Op-Amp – inverting & non-inverting amplifier		
	4) Op-Amp summer & difference amplifiers.		
	5) Op-amp – square wave generator, slew rate		
	$\begin{array}{c} \textbf{6)}  1 \text{ imer} - \text{astablemultivibrators.} \\ \textbf{7)}  \textbf{7)} $		
	/) Timer- monostable mutivibrators.		
	8) Wien Bridge Oscillator – transistor & op-amp		

versions.	
9) Study of Basic Logic Gates – NOT, AND, OR,	
NAND, NOR.	
10) DeMorgan's Laws & use of NAND & NOR	
as basic building blocks.	
11) J-K Flip Flop – truth table, Ripple & Decade	
$12) \mathbf{M}^{\prime}$	
12) Microprocessors: Learning (get to know) the	
Hardware of a microprocessor.	
<b>NOTE:</b> A minimum of 8 experiments are	
expected to be performed.	

\*There will be continuous assessment of skills being acquired through class work, practical and periodic assignments / project works / tests/ orals etc.

\*Journal to be submitted at the end of each term for assessment

NOTE: A candidate has to secure minimum percentage /grade: 40 % as per Training Circular No 4 of 2005 by DG Shipping, Govt of India.

#### **Reference Books:**

- 1. Communication Electronics N.D. Deshpande, D.A. Deshpande
- 2. Operational Amplifiers & Linear integrated circuits Coughlin & Drscoll
- 3. Electronic Devices & Circuit Theory
- Coughlin & Driscoll
- 4. Basic Electronics A text-lab Manual

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# Contents of syllabus for USNSC 301 –Computer Science Semester III

Unit No.	Topics/Sub Topics	Theory	Practical
Unit I	Basic Hardware Familiarization:	08 Hrs.	
	Different functional parts of a computer and their functions		
	Printer, Key board, Hard disk and Mouse.		
	<b>Operating System:</b>		
	Explain the Windows Operating System. Explain		
	different types of files and their extension. Finding,		
	sorting and hyper linking a file.		
	Basics of C:		
	History of C. C character set, C operators.		
	Formattedinput and output. Data Types. Constants		
	and variables.		
	Operators: Arithmetic, Increment &		

	Decrement, Modulo division, Relational, Logical,		
	Conditional andComma and decision making.		
Unit II	Networks:	15 Hrs.	
	Identify network cable CAT 5 and CAT 6. Explain		
	crippling and punching of the network cable.		
	ExplainE-mail, Virus protection and firewall.		
	Computerconnectivity: LAN, MAN and WAN.		
	Internet and various facilities available on		
	internet, Satellite based Communication.		
	Computer arithmetic:		
	numbersystems and mutual conversion.		
	Memorymeasurement: Bits, Bytes, KB, MB, GB,		
	TB. Units of run-time measurement: sec, ms, $\mu$ s, ns, ns, fs as Different computer environments: Batch		
	processing, Time sharing.		
	<b>C Programming:</b> While, do and do-While loops.		
Unit III	MS-Word:	22 Hrs	
	Explain how to create and save a word file		
	usingvarious short cuts. Explain how to manage		
	files intofolders and sub-folders. Demonstrate the		
	use of a printcommand and its various options.		
	Explain the variousoptions of paragraphs and		
	bulleting.		
	MS- Excel:		
	Explain how to create and save an excel file using		
	various short cuts. Explain how to work with		
	rows, columns, and various cell formatting options.		
	Createformula and employ the function wizard.		
	C Programming:		
	For loop. Switch-Case, continue and break		
	statements.		
Practical	MS-Word: Introducing tables and columns.		15 Hrs.
	Mailmerging address for envelopes.		
	MS-Excel: Creating and opening workbook		
	andentering data. Use of formulas, functions		
	andnamed ranges to process data.		
	C Programming: To understand various types of		
	control statements, To understand various loops and		
	the switch- case statement.		

## Contents of syllabus for USNSC 401 –Computer Science

#### Semester IV

Unit No.	<b>Topics/Sub Topics</b>			Theory	Practical		
Unit I	MS- Power point:			8 Hrs.			
	Explain how to cr	reate and save a	Power point fi	le.			
	Explain various la	yout options of	a new slides an	nd			
	how to create them	1.					
	<b>PDF:</b> Explain why	use a PDF fil	e. Create a PI	DF			
	document.						
	C Programming:						
	Arrays: Declaration	on and initial	lization of o	ne			
	dimensional, two d	limensional and	character array	/S.			
	String handling f	functions from	standard libra	ry			
	(strlen(), strcpy(),	strcat (), strcmp	( )).				
Unit II	E-Commerce:		1 1. 1.	, 15 Hrs.			
	The information	technologies	and its relat	ed			
	Digital Signature F	Protocols for Trai	nsactions	liu			
	C Programming:						
	Functions: Need of	of functions, de	efining function	ns,			
	function call with re	eturn values.	C				
Unit III	MS- Access:			22 Hrs.			
	Explain what is a	Explain what is a database? Explain Tables, Field,					
	Record, Column, I						
	2007. Explain ho	nd					
	Form in MS Acces						
	C Programming:						
	Pointers: Under	ng					
	pointer expression	re					
	declaring and acce	,					
Practical	MS-Power pe	oint: Creating a s	imple text slide	<b>S.</b>	15 Hrs.		
	PDF: Create	a PDF documer	nts. Use conver	ter			
	(Word to PD)	~~					
	<ul> <li>MS-Access:</li> <li>Database wit</li> </ul>	ge					
	Database with the following.						
		Field Size					
	Field Name	Data Type	orFormat				
		Number	10				
	Primarv Kev	Text					
	Name	Text	15				
	Surname	Text	15 N 1				
			Number				
	Telephone	Number	Integer				

			Medium	
	Date of Birth	Date/Time	Date	
	Stipend	Currency		
	Foreigner	Yes/No	Yes/No	
	Save the table a	s "Students Table	e"	
E- WO C	<ul> <li>Create a qu Name and res</li> <li>Create a repo Telephone N</li> <li>Commerce:Simpleb site with minim</li> <li>Programming</li> <li>To understan</li> <li>To understan</li> <li>To understan</li> <li>To understan</li> <li>print values reference</li> <li>Problem bas solving a sph are input, etc</li> </ul>	ery showing on spective Stipend. ort showing the umber. ole exercise using num details. d arrays in 'C'. d functions in 'C nd pointers. Wri and their addre sed on nautical erical triangle wl	Ily Student F Fields Name a g HTML.Creat  ite a program sses and call sciences. L hen its three sid	irst and e a to by ike des

\*There will be continuous assessment of skills being acquired through class work, practical and periodic assignments / project works / tests/ orals etc.

\*Journal to be submitted at the end of each term for assessment

NOTE: A candidate has to secure minimum percentage /grade: 40 % as per Training Circular No 4 of 2005 by DG Shipping, Govt of India

#### **Recommended Books For Reference:**

1. Practical Microsoft Office 2007:	June Jamrich Parsons
2. Computer Fundamentals Architecture and	Organization: B Ram
3. Let us 'C'	Kanitkar, 3 <sup>rd</sup> BPB
4. Computer Networking from LAN's to WAN	V's, Hardware, Software & Security
5. Turbo C reference manual	
6. Programming in C: Kris A. Jamsa	Galgotia Publications Pvt. Ltd.
7. Mastering turbo C: Kelly/Bootle	EPB
8. Turbo C programming technique:	Stevens A. : BPB
9. Computer Virus – prevention, detection & re	emoval Kapur R : BPB
10. Introduction to computer science vol.	I & II Jain S. : BPB
11. Introducing computers I, II & III Me	hta S. BPB

**Objective:** - The subject will develop basics of Principles of Navigation / Practical Navigation - II and Voyage Planning & Collision Prevention - II.

Contents of	of syllabus for USNSC 302 – NAVIGATION II
Semester 1	III
Unit No	Tonios/Sub Tonios

Unit No.	Topics/Sub Topics	Theory	Practical
Unit I	Section A -	15 Hrs.	
	The celestial sphere, celestial poles equinoctial,		
	declination, celestial meridians, vertical circles,		
	prime vertical, Ecliptic, First point of Aries, RA,		
	SHA, GHA, LHA.v and d corrections for moon and		
	planets. Position of a heavenly body on celestial		
	sphere by its declination and GHA, or by its altitude		
	and azimuth, or by its celestial latitude and		
	longitude.		
	Nautical Almanac: Information in Nautical Almanac		
	and using itfor celestial observations		
	Section B –		
	the true Azimuth of a neavenly body, the compass error and hence the deviation of		
	themagnetic compass for the direction of the ship's		
	head(ABC tables).		
Unit II	Section A Visible sensible and rational horizons zenith	20 Hrs.	
	nadir, sextant altitude, apparent altitude, correction		
	of altitude, dip, refraction, semi-diameter, parallax		
	in altitude, horizontal parallax, augmentation to		
	True Zenith dist. Total correction tables. Artificial		
	horizon & correction of altitudes there from; back		
	angle altitudes.		
	circle of position why P/L is at right angles to the		
	Azimuth – exceptions.		
	Section B –		
	10 find the latitude by meridian altitude of a heavenlybody. To calculate meridian passage time		
	andapprox meridian altitude for setting on the		
	sextant(computed altitude).		
Unit III	Section A Position to draw the P/L Effect of change of DR	10 Hrs.	
	position on position for P/L and practical		
	applications.		
	<b>Section B</b> Latitude and position line by observation of Polaris		
Practical	Sextant – To use sextant for altitude of heavenly		15 Hrs
I I UCUCUI	bodies. Then to correct the sextant altitude to true		10 111 50

	altitude required for astronomical calculations –		
	Individual and total corrections.		
Contents of	of syllabus for USNSC 402 – NAVIGATION II		
Semester ]		1	1
Unit No.	Topics/Sub Topics	Theory	Practical
Unit I	<ul> <li>Section A - Azimuths and amplitudes; Derivation of formula: Sin amp</li> <li>=Sin decl. sec lat. Apparent altitude of Sun, Moon at timeof theoretical rising or setting.</li> <li>Section B</li> <li>To find the compass error and deviation fromamplitude of Sun and Moon.</li> <li>From an observation of any heavenly body near themeridian to find the direction of the position line</li> </ul>	15 Hrs.	
	themeridian, to find the direction of the position line and thelatitude corresponding to the D.R. longitude through which the PL passes. Time limits for ex- meridian sight.		
Unit II	Section A - Rising, culmination and setting of heavenly bodies. To findtime of meridian passage, sunrise, sunset, moon rise andmoon set by calculation and by perusal of nauticalalmanac with appropriate corrections. Section B - To find the longitude corresponding to the DR latitudethrough which the position line passes and the direction of position line from an observation of	15 Hrs.	
Unit III	<ul> <li>any heavenly body.(Long by chron).</li> <li>Section A - True and apparent motion of bodies. Solar time, Solar day;apparent sun, mean sun, and dynamical mean sun; equation of time. Time and hour angle, Hour circles, Greenwich time, local time, zone time &amp; standard time. Keeping time at sea, advancing &amp; retarding of clocks with change of longitude; International date line. Sidereal time,sidereal day, why stars rise four minutes earlier each day, conversion of solar time to sidereal time and vice-versa. Section B - To find the intercept, Intercept termination point and direction of position line from an observation of any heavenly body. (Intercept Method).</li></ul>	15 Hrs.	
Practical	Use of Azimuth Mirror and pelorus.		15 Hrs.

\*There will be continuous assessment of skills being acquired through class work, practical and periodic assignments / project works / tests/ orals etc.

\*Journal to be submitted at the end of each term for assessment

#### NOTE: A candidate has to secure minimum percentage /grade: 70 % as per Training Circular No 4 of 2005 by DG Shipping, Govt of India Reference Books:

- 1. Principles of Navigation
- 2. Principles of Navigation
- 3. Practical Navigation
- 4. Admiralty Manual of Navigation Vol. I & II
- 5. The Principles & Practice of Navigation
- 6. Nicholl's Concise Guide Vol. I & II
- 7. Bridge equipment, Charts & Publications
- 8. Nories Nautical Table
- 9. Nautical Almanac

#### Contents of syllabus for USNSC 302 - VPCP II

#### Semester III

Unit No.	Topics/Sub Topics	Theory	Practical
Unit I	<ul> <li>VOYAGE PLANNING</li> <li>Elementary Knowledge of Passage Planning and execution – 4 stages of passage planning. Landfall in fog and clear weather. The selection of a suitable anchorage.</li> <li>COLLISION PREVENTION</li> <li>More detailed knowledge of 'International Regulations for Preventing Collision at Sea' than that at the first year level. IRPCS – Part C – Rules 20 to 26</li> </ul>	10 Hrs.	
Unit II	VOYAGE PLANNING Development of electronic Chart display system. Raster & Vector Charts COLLISION PREVENTION IRPCS – Part C – Rules 27 to 31 The IALA system of buoyage	10 Hrs.	
Unit III	<b>VOYAGE PLANNING</b> To find the time and height of high and low water at Standard Ports. The use of Admiralty Tide tables and tidal curves to find the time at which the tide reaches a specified height or heights of the tide at a given time and thence the correction to be applied to soundings or charted heights of shore objects. <b>COLLISION PREVENTION</b> IRPCS – Part D – Rules 32 to 37, Part E – Rule 38	10 Hrs.	
Practical	<ol> <li>To determine ship's position by the 'running Fix' method with and without current.</li> <li>To find the ship's position by 'Doubling the angle on the Bow' method.</li> <li>The use of a station pointer to plot ships</li> </ol>		30 Hrs.

- Capt. P.M. Sarma Capt. Joseph & Capt. Rewari Capt. H. Subramanium
- A. Frost

Capt. H. Subramanium

	<ul> <li>position - given two horizontal angles.</li> <li>4) Collision situations in restricted visibility with or without Radar. Statutory obligations under both circumstances.</li> <li>5) Recognition of various buoys and marks under IALA system and appropriate actions required under the rules.</li> </ul>		
Contents	of syllabus for USNSC 402 – VPCP II		
Semester 2	IV	1	1
Unit No.	Topics/Sub Topics	Theory	Practical
Unit I	VOYAGE PLANNING The interpretation of a chart or plan, particularly the information given about Lights, Buoys, Radio Beacons and other Navigational Aids. COLLISION PREVENTION IRPCS Part F – Rules 39 to 41	10 Hrs.	
	Precautions while using floating navigational aids,		
	such as buoys, light vessels etc.		
Unit II	<b>VOYAGE PLANNING</b> Depths and height contours. Tidal Streams Traffic lanes and separation zones. Recognition of the coast and radar responsive targets. Chart correction. <b>COLLISION PREVENTION</b> Radar Plotting. Relative plot - Report to Master. Set and Drift	10 Hrs.	
IInit III		10 Hrs	
	VUYAGE PLANNING	10 1115.	
	Geographical Range, Luminous Range, Nominal range; and their significance.		
	COLLISION PREVENTION		
	Radar Plotting - Action by own ship, Action by Target ship.		
Practical	VOYAGE PLANNING		30 Hrs.
	1. Use of single position line obtained from a celestial observation when near a coast to keep safe distance off the coast.		
	2. To find course made good using the three point bearing method – with & without current		
	COLLISION PREVENTION		
	1. The students will be required to identify various collision situations by day and by night. Practical's to be held using a magnetic board, wooden models, overboard projector, video tapes or any other aid to simulate such conditions.		

collision situation broadly under the headings – 'recognition', 'responsibility', 'action', 'appropriate sound signals' and ordinary practice of seaman'.	
NOTE: The second year examination will include	
the entire 'practical's portion of the first year.	

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\*Journal to be submitted at the end of each term for assessment

NOTE: A candidate has to secure minimum percentage /grade: 70 % as per Training Circular No 4 of 2005 by DG Shipping, Govt of India Reference Books:

1. Chartwork	Capt. S.S. Chaudhari
2. Chartwork for Mariners	Capt. S.K. Puri
3. Marine Chartwork	D.A. Moore
4. IMO Rule of the Road	Bhandarkar Publication
5. A guide to The Collision avoidance Rules	A.N. Cockroft
6. International Light, Shape and sound Signal	D.A. Moore
7. Admiralty IALA Maritime Buoyage System	
8. Modern Chartwork	W.H. Squair
9. Navigation for Watchkeepers	L.W.J. Fifield
10. Shipborne Radar	Capt. H. Subramanium
11. International regulations for Preventing Collisi	on at Sea IMO
12. Manual of the Rule of the Road	Capt. S.K. Puri

**Objective:** -This subject exposes the students to Ship Operation Technology Paper- II, Bridge Procedure and legal Knowledge& Naval Architecture Paper - II

#### Contents of syllabus for USNSC 303 – SOT II

Semester III	

Unit No.	Topics/Sub Topics	Theory	Practical
Unit I	<ul> <li>Section – A – CARGO WORK</li> <li>Introduction to codes and guidelines for carriage of dry bulk cargoes, bulk chemicals, bulk gas, Dangerous goods in bulk and packaged form</li> <li>Section –B - SEAMANSHIP</li> <li>ANCHOR WORK:</li> <li>Use &amp; types of anchors.</li> </ul>	20 Hrs.	
	2. Cable assembly and their care including		

	markings. Parts of and connecting a lugless		
	shackle		
	5. Anchoring Terms - cable, link, swivel, joining		
	snackle, snackle as a term of length, bitter end,		
	a cockbill(anchor ready for letting go), Anchor		
	aweign, clear nawse, foul nawse, clear or foul		
	anchor, anchor dragging, long stay, short stay,		
	up and down, to veer cable, weigning anchor,		
	yawing, brought up to three in water / four on		
	deck etc.		
	4. Anchoring procedure – in deep & shallow		
	5 Easters involved in determining the length of		
	J. Factors involved in determining the length of		
	6 Securing anchor for see, covoring spurling nine		
	use of how stopper, sledge harmer, chain hook		
	7 Duties on anchor watch		
	8 Foul anchor or hawse		
	9 Hanging off an anchor		
	10 Breaking and slipping cables		
	11 Load on anchor due to wind current waves		
	12. Anchor holding power		
	13. Dragging anchor – How to check, what to do		
	14. Causes for loss of anchor		
	15.Use of anchor buoys,		
	16.Mooring – Standing & running moor		
	CODE OF SAFE WORKING PRACTICE -		
	Safety precautions while anchoring;		
Unit II	Section – A – CARGO WORK	13 Hrs.	
	Planning stowage of general cargo taking into		
	account stowage factor, load density, port		
	rotation, hazardous nature, special stowage		
	requirements relating to cargoes not covered by		
	special codes. Calculation based on the same. Use		
	of dunnage for load distribution.		
	Section – B - SEAMANSHIP		
	SURVIVAL AI SEA:		
	1. Boat drifts and musters. Preparation of Muster		
	11St.		
	2. Action prior to, and after abandoning sinp.		
	4 Handling of the craft		
	5 Landing cionals		
	6 Outline knowledge of SOLAS requirements		
	of life saving appliances		
	CODE OF SAFE WORKING PRACTICE		
	1. Safety precautions during the use of personnel		
	basket;		
	2. Precautions while using portable ladder.		

Unit III	Section – A – CARGO WORK	17Hrs	
	Principles of stowage/securing of cargo taking into	141115	
	account ship's motion at sea (Outline knowledge of		
	CSS Code & Cargo securing Manual (CSM)		
	Section – B - SEAMANSHIP		
	FIRE PREVENTION AND FIRE FIGHTING:		
	1. Causes of fire.		
	2. The fire triangle.		
	3. Principles of fire fighting.		
	4. Types of fire and methods of extinguishing		
	each type.		
	5. various methods of detection and fighting of		
	6 Causes of fires in tankers during various		
	operations carried out by tankers and its		
	prevention methods		
	7. Outline knowledge of SOLAS requirements on		
	FFA.		
	CODE OF SAFE WORKING PRACTICE		
	1. Standard crane signals.		
	2. Safety precautions while using bosun's chair and		
	stages		
Practical	1. Rigging a pilot ladder/Use of manropes –		
	Precautions for safety of men boarding by such		15 hrs.
	ladders.		10 1115.
	2. Maintenance & repair of various ladders used on		
	board ships		
	3. Safety procedure involved in working aloft on		
	stage and a Bosun's chair (group activity of 2-3		
	cadets)		

# Contents of syllabus for USNSC 403 – SOT II Semester IV

Unit No.	Topics/Sub Topics	Theory	Practical
Unit I	<ul> <li>Section - A - CARGO WORK</li> <li>1. Factory act</li> <li>2. DOCK WORKERS (SAFETY, HEALTH AND WELFARE) ACT</li> <li>3. Requirements for annealing and periodical testing of cargo gear</li> <li>4. Chain register</li> </ul>	15 Hrs.	
	<ul> <li>4. Chain register.</li> <li>5. Methods of testing cargo gear</li> <li>Section –B - SEAMANSHIP</li> <li>SHIP MANOEUVRING:</li> <li>Effect of various factors on maneuvering – Controllable &amp; Uncontrollable factors. Concept of pivot pointManagement of ship in heavy weather.</li> <li>CODE OF SAFE WORKING PRACTICE</li> <li>1. Precautions while using electric, pneumatic and</li> </ul>		

	hydraulic (power) tools and appliances;		
	2. Precautions while working with compressed air;		
Unit II	Section – A – CARGO WORK	15 Hrs.	
	Machinery for handling of cargoes such as:		
	Derrick and rigs, Cranes, Heavy lift crane, Winches		
	including self tension winch, Conveyor belt/chute		
	arrangement, Container handling systems.		
	Section –B - SEAMANSHIP		
	SHIP MANOEUVRING:		
	1. Precaution in maneuvering for launching of boats or life rafts in bad weather		
	2 Methods of taking on board survivors from life		
	boats and life rafts.		
	CODE OF SAFE WORKING PRACTICE		
	1. Safety precautions while painting funnel, Radar		
	mast;		
	2. Safety precautions while using bosun's chair and		
	stages;		
Unit III	Section – A – CARGO WORK	15 Hrs.	
	discharging such as cranes gantries conveyor belt		
	system etc.		
	Section –B - SEAMANSHIP		
	GENERAL		
	1. Properties and uses of various paints.		
	(DD Specs etc.) Use of side shores bilge		
	blocks and bilge shores.		
	3. Measures to be taken to prevent spillage of oil		
	during cargo work, bunkering or oil transfer.		
	4. Oil record book – Requirements & entries		
	CODE OF SAFE WORKING PRACTICE		
	1. Precautions while working with chipping		
	machines;		
	2. Precautions whilst working on lathe machine.		
Practical	1. Demonstrate the ability to climb a ship's mast		15 Hrs.
	2. Demonstrate ability to climb down stairs in		
	accommodation and ladders. Show the procedure to		
	carry objects up or down the ladders or stairs. Use		
	of bow stopper, devil's claw		
	3. To disconnect and connect a lugless shackle		
	4. Surface Preparation and painting		

\*There will be continuous assessment of skills being acquired through class work, practical and periodic assignments / project works / tests/ orals etc.

#### \*Journal to be submitted at the end of each term for assessment NOTE: A candidate has to secure minimum percentage /grade: 60 % as per Training Circular No 4 of 2005 by DG Shipping, Govt of India

#### **Reference books**

- 1. Cargo Work
- 2. Stowage of cargo
- 3. Theory and Practice of Seamanship
- 4. Seamanship & Cargo work
- 5. Seamanship Notes

O.O. Thomas Danton

Kemp and Young

Dinger

- Kemp and Young
- 6. Code of safe working practices for merchant seafarers MCA

# Contents of syllabus for USNSC 303 – Bridge Procedure and legal Knowledge Semester III

Unit No.	Topics/Sub Topics	Theory	Practical
Unit I	BRIDGE PROCEDURE	15 Hrs.	
	Bridge Procedures Guide and its Contents: -		
	Understanding of the principles of safe		
	watchkeeping as detailed in the ICS Bridge		
	Procedures Guide. Navigation checklists		
	Bridge manning levels: Circumstances in which the		
	OOW (officers on watch) should call Master, extra		
	lookouts, Explain responsibilities of OOW as in-		
	charge of Navigational watch.		
	Steering, Telegraph & BT Orders		
	Guidelines for watch keeping at sea, at anchor and		
	in port. VTS Procedure, Ship Reporting Systems.		
	MARINE COMMUNICATION		
	Introduction and use of Radio Communication		
	Equipmenton board ship for distress and safety –		
	Selection of suitable frequencies.		
	LEGAL KNOWLEDGE		
	Merchant Shipping Act 1958 with special reference		
	Certificate of Registry. Passenger Ships.		
	Certificates and other documents required to be		
	carried on a ship – How obtained and their		
Unit II	BRIDGE PROCEDURE	15 Una	
	<b>Record keeping and Entries in logbook:</b> Explain	13 115.	
	the importance of recording all relevant information		
	in Logbooks.		

	Monitor navigational instruments and record their		
	performance and other relevant details, Check and		
	compare Compasses regularly for errors and apply		
	them correctly, Record all movements and activities		
	related to the navigation of the ship, IMO Guidelines		
	for recording of events related to Navigation Res A.		
	916 (22).		
	MARINE COMMUNICATION		
	Radio Regulations relating to Maritime Services		
	including maritime frequency allocation.		
	LEGAL KNOWLEDGE		
	Certificate of Officers, Seaman and Apprentices,		
	Engagement, Management and discharge of crew,		
	Manning scales. Contracts of employment, Wages		
	Money orders Payments into bank accounts		
	Desertion, deceased seaman, engagement of		
	substitutes, repatriation.		
Unit III	BRIDGE PROCEDURE	15 Hrs	
	Use of Radar in navigation - Basic principles and		
	use of radar.Obtaining position fix by radar bearings		
	and ranges, possible errors, Reliability of fix, Aids to		
	radar navigation: Use of passive (trails, history) and		
	active aids, RACONs and SARTs. Explain AIS		
	overlay on radar / ARPA, The use of parallel		
	indexing technique in radar navigation:, wheel over		
	positions and safety margins.		
	CODE OF SAFE WORKING PRACTICE		
	1. Safety precautions while repairing radar;		
	2. Safety precautions while entering battery room;		
	MARINE COMMUNICATION		
	Satellite Communication and Altering system –		
	Equipment on board and ashore. Methods adopted.		
	LEGAL KNOWLEDGE		
	entries therein. Offences relating to misconduct to		
	endangering ship against persons on board.		
	Discipline and treatment to disciplinary offences.		
	Crew accommodation. Hygiene of the ship and		
	welfare of the crew. Inspection and reports. Fresh		
	water and provisions. Procedure in cases of		
	infectious diseases, illness or accident. Maritime		
	declaration of health. Port Health requirements.		

Practical	<b>RADAR:</b> Practical adjustment of operational	
	controls to their optimum setting. To carry out	15 hrs.
	performance check, using performance monitor. To	
	take ranges and bearings of fixed and moving	
	objects. To identify land objects using radar	
	observations. Evaluation of risk of collision.	
	Automatic Radar Plotting Aid (ARPA): Set vector	
	lengths based on own vessel speed and range scale in	
	use. Advantages and limitations of use of relative	
	and true vectors and when to use which for optimum	
	efficiency, The effect of course and speed changes	
	on the display. Advantages of compass stabilization	
	of a relative display, Use of Trial manoeuvre and	
	predictive motion vectors.	

Contents of syllabus for USNSC 403 – Bridge Procedure and legal Knowledge Semester IV

Unit No.	Topics/Sub Topics	Theory	Practical
Unit I	BRIDGE PROCEDURE	15 Hrs.	
	Keeping an effective anchor watch - Importance of		
	Beam bearing, Use of Global Position Fixing System		
	(GPS) and Radar during anchor watch, Turning		
	circle in relation to length of vessel and length of		
	cable used, Indication of anchor dragging, Swinging		
	of vessel anchored to tide / wind, Use of shapes,		
	lights and sound signals as per IRPCS 1972.		
	LEGAL KNOWLEDGE		
	Custom House procedure, entering and clearing ship.		
	Load Line Marks, Entries and reports in respect of		
	freeboard. Draft and allowance.		
	Calculations on Lay dayand Load Line (zone		
	problems).		
	Safety of the ship, crew and passengers. Assistance		
	to vessels in distress and salvage. Duties of Master		
Init II	BRIDCE PROCEDURE	15 Hrs	
	Familiarization on Automatic Identification	15 111 5.	
	System (AIS), Voyage Data Recorder (VDR),		
	Bridge Navigation Watch Alarm System		
	(BNWAS), Ship Security Alert System (SSAS), Long Range identification and Tracking (LRIT)		
	MARINE COMMUNICATION		
	Global Maritime Distress and Safety System –		

	principles and actual applications.		
	World Wide Navigational Warning System – India's		
	role as a Co-coordinator for area 8.		
	LEGAL KNOWLEDGE		
	The law relating to the reporting of derelicts,		
	tropical revolving storms and other dangers to		
	navigation. Compulsory and non-compulsory		
	pilotage.		
Unit III	MARINE COMMUNICATION	15 Hrs	
	Meteorological Broadcast – Routine weather	15 1115.	
	messages and storm warnings.		
	Search and Rescue Communications, IAMSAR		
	<b>LEGAL KNOWLEDGE:</b> A general knowledge of		
	shipping practice and documents with particular		
	reference to charter parties bills of lading and Mates		
	receipte. The law relating to carriage of cargo and		
	the ship aways lightliting and responsibilities		
	the snip owners hadilities and responsibilities.		
	Protests, certificate of sea worthiness.		
Practical	<b>ECHO SOUNDER:</b> Use and care of both visual and		15 Hrs.
	graphic types. To take soundings using Echo		
	Sounder or Echo sounder simulator.		
	MARINE COMMUNICATION		
	Practical usage of 'International Code of Signals'.		
	Toprepare portable radio equipment for operation.		
	Ship to ship and ship to shore communication		
	exercises by portable VHF sets.		

\*There will be continuous assessment of skills being acquired through class work, practical and periodic assignments / project works / tests/ orals etc.

\*Journal to be submitted at the end of each term for assessment

NOTE: A candidate has to secure minimum percentage /grade: 60 % as per Training Circular No 4 of 2005 by DG Shipping, Govt of India References –

1. Shipborne Radar	Capt. Subramanium
2. International Code of Signal	HMSO
3. Business and Law	Hopkins
4. Merchant shipping Act	GOI
5. SOLAS	IMO
6. International convention on Loadline	IMO
7. Search and Rescue Manual	IMO
8. Bridge Procedure Guide	ICS
9. Bridge Team Management	NI
10.Code of safe working practices for merchant seafarers	MCA

## Contents of syllabus for USNSC 303 – NAVAL ARCHITECTURE II Semester III

Unit No.	Topics/Sub Topics	Theory	Practical
Unit I	(A)SHIP STABILITY	15 Hrs.	
	Concepts of BM & KM. Calculation based on BM		
	& KM, KM Curves.		
	Use of Simpson's Rules in the computation of areas;		
	volumes and centroids.		
	(B)SHIP CONSTRUCTION		
	Longitudinal and transverse framing, Beams and		
	Beam knees. Functions, constructions and stiffening		
	of water tight bulkheads including collision		
	bulkhead. Shell and deck plating.		
	Bilge keels. Double bottom and peak tanks. Side		
	and wing tanks. Bilges.		
	Construction, stiffening and closing arrangements of		
	opening on deck and superstructures.		
	Sounding pipes, air pipes, ventilators. Hawse-pipes		
<b>.</b>	spurling pipes and their securing arrangement.	4	
Unit II	Determination of position of the longitudinal centre	15 Hrs.	
	of gravity of a ship for different conditions of load		
	and ballast. The effect on the position of centre of		
	shifting weights.		
	Longitudinal centre of buoyancy, Longitudinal		
	metacentre and centre of flotation and factors		
	GM, KM,		
	(B)SHIP CONSTRUCTION		
	An outline knowledge of the functions of		
	ClassificationSocieties. Surveys for assignment and		
In:4 III	(A)SHIP STABILITY	1511mg	
	Theory of Trim. Changes of trim and draft due to	15015	
	loading, discharging and shifting weights. Change		
	of trim due to change of density.		
	to ships.Calculations based on the foregoing		
	including those based on "Trim and Stability		
	(B)SHIP CONSTRUCTION		
	General Pumping arrangements – Bilge and Ballast		
	line systems. Pumping arrangement on tankers.		
	Methods adopted to maintain integrity of divisions		
	and opening in the hull including stern, side and bow		
	doors.		

#### Contents of syllabus for USNSC 403 – NAVAL ARCHITECTURE II Semester IV

Unit No.	Topics/Sub Topics	Theory	Practical
Unit I	(A)SHIP STABILITY	15 Hrs.	
	List – Calculation of List while Loading, Discharging		
	and/or shifting weights, Correction of List.Combined		
	list and trim. Draft increase due to list. List when		
	initial GM is zero.		
	(B)SHIP CONSTRUCTION		
	Rudders, construction and support. Stern frame,		
	Propellers and Propeller shaft; stern tube and		
	adjacent structure.		
Unit II	(A)SHIP STABILITY Curve of statical stability and its practical usage,Cross Curves of stability, K. N. Curves, KN	15 Hrs.	
	Values, determination of Righting moment using		
	Calculation of List by GZ Curve. Carriage of deck		
	cargoes and their effect on stability. (B)SHIP CONSTRUCTION		
	General ideas on various plans supplied by shipyard. Midship sections of General cargo ship tanker bulk		
	carrier, container, OBO.		
	Causes and methods of corrosion control in steel		
	work and also between dissimilar metals including		
	current system.		
Unit III	(A)SHIP STABILITY	15 Hrs.	
	Stowage of grain and stability aspects in respect		
	involved and the manner of presentation of the		
	information relating to grainheeling Moments and		
	the resulting angle of heel as presented in the		
	National Statutory Regulations.		
	(B)SHIP CONSTRUCTION		
	Stresses and strains in ships in still water and in a seaway.		
	Parts of ship specially strengthened and stiffened to		
	resist such stresses including panting and pounding.		

\*There will be continuous assessment of skills being acquired through class work, periodic assignments / project works / tests/ orals etc.

NOTE: A candidate has to secure minimum percentage /grade: 60 % as per Training Circular No 4 of 2005 by DG Shipping, Govt of India

#### **Reference Books:**

1. Ship Stability at Operational & Management Level	Capt. H. Subramanium
2. Ship Stability for Masters and Mates	Derret
3. Ship Stability Notes& Examples	Kemp & Young
4. Merchant Ship Stability	A.R. Lester
5. Problems on MV Hindship	Capt. Joseph & Rewari
6. Ship Construction for Marine Students	Reeds
7. Ship Construction sketches & Notes	Kemp & Young
8. Ship Construction	D J Eyres
9. Merchant Ship Construction	Pursey
10. Merchant Ship Construction	Dr D A Taylor
11. International Grain Code	IMO

# **Objective:** - This subject exposes the students to Environment Science – II and Marine Engineering & Control System- II

Contents of	of Syllabus for US NSC 304 – Environmental Science	e - II
Semester I	II	

Semester III			
Unit No.	Topics/Sub Topics	Theory	Practical
Unit I	Formation of the earth and its structure - Evolution	18 Hrs.	
	of continents and ocean basins – Continental drift		
	hypothesis – concept of isotasy and its application		
	to surface phenomena – Recent ideas on drift: plate		
	tectonics – practical significance of recent		
	information.		
Unit II	Materials of the earth's crust: minerals and rocks –	14 Hrs.	
	Rock types and their formation – Lithological		
	characteristics and their impact on landform		
	development – Tectonic landforms: folds, faults and		
	associated features – Volcanic and seismic		
	activities: associated landforms.		
Unit III	Exogenic forces: denudation – Weathering, mass-	13 Hrs	
	wasting and erosion – Marine landforms – Sea level changes – Classification of coasts		
	1 Identification of common rocks and minorals		
Practical	1. Identification of common of tono anothing and intermediation of tono anothing and intermediation of tono anothing and intermediation.		
	2. Reading and interpretation of topographical maps		15 hrs.
	Ior coastal areas.		
	3. Reading and interpretation of hydrographic charts.		
	4. Preparation and interpretation of tidal charts		

## Contents of syllabus for USNSC 404 – Environmental Science - II Semester IV

Unit No.	Topics/Sub Topics	Theory	Practical
Unit I	Oceans:	18 Hrs.	
	Major relief features of the ocean-floor – Bottom		
	Properties of oceanwater: temperature salinity and		
	density – Their vertical and horizontal distribution –		
	Ocean currents: factors and patterns – Ocean		
	deposits: types and their work – NIO and its		
	activities.		
	mangroves etc. Distribution of biotic resources –		
	Problems of their exploitation – Environmental and		
	other stresses – Remedial measures – Mariculture:		
	merits and limitations.		
	Abiotic resources: types Oceanic mineral nodules		
	and places – Oil and natural gas – Technological		
	Environmental oceanic problems and oceanic hot-		
	spots – Future scenario.		
	Oceanic water as a resource: navigation, power		
	generation, source of drinking water etc Oceanic		
	Islands and their strategic significance – Indian		
<b>T</b> T •4 <b>TT</b>	Ocean Islands.	14 11	
Unit II	WIND: Factors affecting atmospheric motion & the	14 Hrs.	
	resulting winds; Beaufort scale of wind force;		
	Geostrophic wind; Gradient and Cyclostrophic		
	Ballot's law		
	Factors affecting atmospheric motion and the		
	resulting winds – Newton's laws and equation of		
	motion – Basic		
	Patterns of air movement.		
	pressure and the resulting circulation – Recent		
	advances in the knowledge of general circulation:		
	upper air waves and jet stream – Dynamics of the		
	Indian monsoon		
Unit III	Seasonal weather and climatic characteristics over India Cyclones in Indian seas and their impact on	13 Hrs.	
	coastal life		
	Weather forecasting methods and techniques –		
	Constraints in accurate forecasts		
Practical	1. True and apparent wind and its vector calculation:		15 Hrs
I lacutal	2. Interpreting Wind Rose.		10 111 50
	3. Interpretation of weather maps		
	4. Estimation of geostrophic wind speed from		
	5. Reading and interpretation of I.M.D. synoptic		

maps.		

\*There will be continuous assessment of skills being acquired through class work, practical and periodic assignments / project works / tests/ orals etc.

\*Journal to be submitted at the end of each term for assessment

#### NOTE: A candidate has to secure minimum percentage /grade: 50 % as per Training Circular No 4 of 2005 by DG Shipping, Govt of India Reference Books:-

1. Physical Geography	Savindra Singh
2. An outline of Geomorphology	Wooldridge & Morgan
3. Continental Drift	D.H. and M.P. Tarling
4. Putnam's Geology	Birkland & Larson
5. Principles of Physical Geography	F.J. Monkhouse
6. Oceanography	J.J. Bhatt
7. Oceanography for geographers	R.C. Sharma
8. The Oceans: Realities & Prospects	R.C. Sharma
9. Atmosphere, Weather and Climate	R.G. Barry
10. Climate and Weather	Flohn Hermann
11.Introduction to Meteorology	Petterssen
12. The Atmosphere	Anthes R.A.
13. Climatology from Satellites	Barrett E.C.
14. World Weather and Climate	Riley D.R.
15. Introduction to Meteorology	Cole F. W.

#### Contents of Syllabus for US NSC 304 – MECS - II

#### Semester III

Unit No.	Topics/Sub Topics	Theory	Practical
Unit I	MECHANICAL ENGINEERING SCIENCE	18 Hrs.	
	Engineering Materials – Common Engineering		
	Materials.		
	Various metals & alloys, Properties & uses.		
	Ceramics and their use.		
	Steels – Elementary metallurgy of steels, steel		
	production -smelting & refining, Iron - carbon		
	diagram to show role of carbon in steels and effect on		
	properties. Types of steel &use.		
	Heat treatment – Heat treatment of steels-obtaining		
	desired properties from steel for use in different		
	areas.		

Unit II	ELECTRICAL ENGINEERING SCIENCE	14 Hrs.	
	AC & DC Machines: DC generators. AC generators.		
	Meaning of frequency, phase & power factor.		
	Parallel running & load shearing. Prime mover-		
	Diesel engine, steam turbines. AC & DC Motors.		
Unit III	<b>ELECTRICAL ENGINEERING SCIENCE</b> Transformers: High and Low voltage transformers, stepup/step down Transformers, Transformer efficiency and maintenance & care. Power distribution: Maniswitch boards, power distributionboards, Circuit breakers, measuring instruments, overloadtrip short circuit trip, fuses other protections. Procedures of maintenance of batteries. Purpose & operation of purifier drive. Navigation light circuit with indicators/alarms & alternative power supply. Services to be supplied from emergency generator. Procedure for starting emergency generator manually.	13 Hrs	
Practical	WELDING SHOP		
	i) Demonstrate the safety precautions to be observed		15 hrs.
	while welding including hot work permit.		
	ii) Identify the arc and gas welding outfits and tools		
	and welding kits.		
	iii) Identify ferrous and non-ferrous metals.		
	iv) Demonstrates the ability to carry out		
	oxyacetylene gas welding and cutting.		
	v) Connects the arc welding kit and selects the		
	current /electrode to carry out arc welding beads		
	v1) Demonstrate the ability to carry out arc welding		
	but and lap joint.		
	BENCH WORK		
	1) Demonstrate the ability to perform a basic fitting		
	jobs of given dimension by using proper hand		
	toolssuchas files, nacksaw, chisel, nammer, scale,		
	i) Demonstrate the use of seren gauge vernier		
	aliper on the above said job		
	iii) Demonstrate the use of pedestal drilling		
	machineon the above said job and carryout		
	reaming operation on the drilled hole		
	iv) Demonstrate the ability to make internal threads		
	by using appropriate tap.		

v) Demonstrates the ability to carry out grinding	
operation on given job.	
ELECTRICAL WORKSHOP	
i) Identify electrical insulated hand tools.	
ii) Identify electrical measuring instruments suchas	
multi meter, tong Tester & megger.	
iii) Demonstrate the ability to identify	
electricalconductors (wires and cables).	
iv) Demonstrate the ability to identify live and	
neutral by using test lamp and multimeter	
v) Identifies the color codes given to phase, neutral	
and earth	
vi) Identify the electrical accessories such as fuse,	
circuit breakers, choke, starters, earthing, pendent	
light holder, tube frame, witch, socket, etc. and	
demonstrates the use of it in electrical circuits.	
vii) Assemble a tube light fitting by using tube	
fittings and test it.	
viii) Assembles a switch board as per drawing	
andcheck its working.	
ix) Identifies safety precautions to take to	
avoidelectrical hazards.	

# Contents of syllabus for USNSC 404 – MECS - II Semester IV

Unit No.	Topics/Sub Topics	Theory	Practical
Unit I	MARINE ENGINEERING	18 Hrs.	
	a) Fresh water: Methods of generation of		
	freshwater fromseawater at sea. Principle,		
	construction & operation offreshwater generator,		
	steam evaporator, flash evaporator& reverse		
	osmosis plant. Treatment of water for		
	obtainingpotable water. Storage and supply of fresh		
	water in ships.Fresh water and sanitary water.		
	<ul> <li>Hydrophase systems.</li> <li>b) Steam – types of marine steam boilers. Construction and operation of water tube and smoke tube boiler. Boiler mountings, accessories, safety features. Waste heat recovery boiler. Boiler</li> </ul>		

	chemical treatment.		
	c) Compressed air - air compressor, uses of		
	compressed air. Storage and distribution of		
	compressed air		
Unit II	MARINE ENGINEERING	14 Hrs.	
	a) Refrigeration & Air conditioning: Principle of		
	components & operation Arrangement of cold		
	storage holds		
	b) Pumps – working principle, construction of		
	different types ofpumps. Selection of pumps for		
	different duties onboard theship.		
	c) Steering – common types of steering gear,		
	electro-nydraulicsteering gears, two and lour ram		
	features Emergency arrangements		
	Legislation national and international, operation		
	andmaintenance. Hydraulic systems – rotary vane		
	actuators.		
	The Wheatstone principle of transmission of steering		
	wheel signals Variable delivery nump Steering		
	gearcircuits. Safe-matic system. Inter-switching of		
	follow-up and non follow-up steering systems.		
Unit III	MARINE ENGINEERING	13 Hrs.	
~			
	Internal Combustion Engine:		
	<b>Internal Combustion Engine:</b> a) Working principles: Classification of various		
	<b>Internal Combustion Engine:</b> a) Working principles: Classification of various types of modern diesel		
	Internal Combustion Engine: a) Working principles: Classification of various types of engines, various types of modern diesel engines. Basicprinciples of cycles, P-V diagrams, work done etc. four		
	Internal Combustion Engine: a) Working principles: Classification of various types of engines, various types of modern diesel engines. Basicprinciples of cycles, P-V diagrams, work done etc. four stroke and two stroke engines		
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Practical	Internal Combustion Engine: a) Working principles: Classification of various types ofengines, various types of modern diesel engines. Basicprinciples of cycles, P-V diagrams, work done etc. four stroke and two stroke engines b) Components – construction, main components and working MACHINE SHOP		15 Hrs.
Practical	<ul> <li>Internal Combustion Engine:         <ul> <li>a) Working principles: Classification of various types of engines, various types of modern diesel engines. Basicprinciples of cycles, P-V diagrams, work done etc. four stroke and two stroke engines</li> <li>b) Components – construction, main components and working</li> </ul> </li> <li>MACHINE SHOP         <ul> <li>i) Demonstrates safety precautions to be observed</li> </ul> </li> </ul>		15 Hrs.
Practical	<ul> <li>Internal Combustion Engine:         <ul> <li>a) Working principles: Classification of various types of engines, various types of modern diesel engines. Basicprinciples of cycles, P-V diagrams, work done etc. four stroke and two stroke engines</li> <li>b) Components – construction, main components and working</li> </ul> </li> <li>MACHINE SHOP         <ul> <li>i) Demonstrates safety precautions to be observed while working on lathe machine</li> </ul> </li> </ul>		15 Hrs.
Practical	<ul> <li>Internal Combustion Engine:         <ul> <li>a) Working principles: Classification of various types of engines, various types of modern diesel engines. Basicprinciples of cycles, P-V diagrams, work done etc. four stroke and two stroke engines</li> <li>b) Components – construction, main components and working</li> </ul> </li> <li>MACHINE SHOP         <ul> <li>i) Demonstrates safety precautions to be observed while working on lathe machine</li> <li>ii) Identifies the parts of lathe machine.</li> </ul> </li> </ul>		15 Hrs.
Practical	<ul> <li>Internal Combustion Engine:</li> <li>a) Working principles: Classification of various types of engines, various types of modern diesel engines. Basicprinciples of cycles, P-V diagrams, work done etc. four stroke and two stroke engines</li> <li>b) Components – construction, main components and working</li> <li>MACHINE SHOP</li> <li>i) Demonstrates safety precautions to be observed while working on lathe machine</li> <li>ii) Identifies the parts of lathe machine.</li> <li>iii) Centre the job on lathe machine</li> </ul>		15 Hrs.
Practical	<ul> <li>Internal Combustion Engine:</li> <li>a) Working principles: Classification of various types of engines, various types of modern diesel engines. Basicprinciples of cycles, P-V diagrams, work done etc. four stroke and two stroke engines</li> <li>b) Components – construction, main components and working</li> <li>MACHINE SHOP <ol> <li>Demonstrates safety precautions to be observed while working on lathe machine</li> <li>Identifies the parts of lathe machine.</li> <li>Centre the job on lathe machine</li> </ol> </li> </ul>		15 Hrs.
Practical	<ul> <li>Internal Combustion Engine:</li> <li>a) Working principles: Classification of various types of engines, various types of modern diesel engines. Basicprinciples of cycles, P-V diagrams, work done etc. four stroke and two stroke engines</li> <li>b) Components – construction, main components and working</li> <li>MACHINE SHOP</li> <li>i) Demonstrates safety precautions to be observed while working on lathe machine</li> <li>ii) Identifies the parts of lathe machine.</li> <li>iii) Centre the job on lathe machine</li> <li>iv) Demonstrates the use of lathe machine by using appropriate lathe tool to reduce diameter by 1.0 mm</li> </ul>		15 Hrs.
Practical	<ul> <li>Internal Combustion Engine: <ul> <li>a) Working principles: Classification of various types of engines, various types of modern diesel engines. Basicprinciples of cycles, P-V diagrams, work done etc. four stroke and two stroke engines</li> <li>b) Components – construction, main components and working</li> </ul> </li> <li>MACHINE SHOP <ul> <li>i) Demonstrates safety precautions to be observed while working on lathe machine</li> <li>ii) Identifies the parts of lathe machine.</li> <li>iii) Centre the job on lathe machine</li> <li>iv) Demonstrates the use of lathe machine by using appropriate lathe tool to reduce diameter by 1.0 mm and carry out facing operation.</li> </ul> </li> </ul>		15 Hrs.
Practical	<ul> <li>Internal Combustion Engine: <ul> <li>a) Working principles: Classification of various types of engines, various types of modern diesel engines. Basicprinciples of cycles, P-V diagrams, work done etc. four stroke and two stroke engines</li> <li>b) Components – construction, main components and working</li> </ul> </li> <li>MACHINE SHOP <ul> <li>i) Demonstrates safety precautions to be observed while working on lathe machine</li> <li>ii) Identifies the parts of lathe machine.</li> <li>iii) Centre the job on lathe machine</li> <li>iv) Demonstrates the use of lathe machine by using appropriate lathe tool to reduce diameter by 1.0 mm and carry out facing operation.</li> </ul> </li> <li>CARPENTRY WORKSHOP</li> </ul>		15 Hrs.
Practical	<ul> <li>Internal Combustion Engine:</li> <li>a) Working principles: Classification of various types of engines, various types of modern diesel engines. Basicprinciples of cycles, P-V diagrams, work done etc. four stroke and two stroke engines</li> <li>b) Components – construction, main components and working</li> <li>MACHINE SHOP</li> <li>i) Demonstrates safety precautions to be observed while working on lathe machine</li> <li>ii) Identifies the parts of lathe machine.</li> <li>iii) Centre the job on lathe machine</li> <li>iv) Demonstrates the use of lathe machine by using appropriate lathe tool to reduce diameter by 1.0 mm and carry out facing operation.</li> <li>CARPENTRY WORKSHOP</li> <li>i) Identify carpentry hand tools such as chisel, jack</li> </ul>		15 Hrs.
Practical	<ul> <li>Internal Combustion Engine:</li> <li>a) Working principles: Classification of various types of engines, various types of modern diesel engines. Basicprinciples of cycles, P-V diagrams, work done etc. four stroke and two stroke engines</li> <li>b) Components – construction, main components and working</li> <li>MACHINE SHOP <ol> <li>Demonstrates safety precautions to be observed while working on lathe machine</li> <li>Identifies the parts of lathe machine.</li> <li>Centre the job on lathe machine</li> <li>Demonstrates the use of lathe machine by using appropriate lathe tool to reduce diameter by 1.0 mm and carry out facing operation.</li> </ol> </li> <li>CARPENTRY WORKSHOP <ol> <li>Identify carpentry hand tools such as chisel, jack plane, augur, mortise gauge, etc.</li> </ol> </li> </ul>		15 Hrs.
Practical	<ul> <li>Internal Combustion Engine: <ul> <li>a) Working principles: Classification of various types of engines, various types of modern diesel engines. Basicprinciples of cycles, P-V diagrams, work done etc. four stroke and two stroke engines</li> <li>b) Components – construction, main components and working</li> </ul> </li> <li>MACHINE SHOP <ul> <li>i) Demonstrates safety precautions to be observed while working on lathe machine</li> <li>ii) Identifies the parts of lathe machine.</li> <li>iii) Centre the job on lathe machine</li> <li>iv) Demonstrates the use of lathe machine by using appropriate lathe tool to reduce diameter by 1.0 mm and carry out facing operation.</li> </ul> </li> <li>CARPENTRY WORKSHOP <ul> <li>i) Identify carpentry hand tools such as chisel, jack plane, augur, mortise gauge, etc.</li> <li>ii) Identify various wood for specific purposes</li> </ul> </li> </ul>		15 Hrs.

	1 • • .• . • 1 •	
111) Identify various woo	od jointing material using	
adhesive, nails, screws etc	2.	
iv) Demonstrate the ability	y to execute wood jointing	
v) Demonstrate the abilit	ty to make a cement box;	
wooden box as per drav	ving by using appropriate	
tools, wood jointing me	ethod and wood jointing	
material / adhesives		
vi) Use of fiber glass repair	ir kits.	
PLUMBING WORKSH	OP	
i) Identify plumbing hand	tools such as pipe wrench,	
dies, pipe benders, hacksa	w, pipe vice, spanners, etc.	
(ship specific).		
ii) Identify leak stopping	material such as Teflon,	
sealant, jubilee clips,	ermeto couplings and	
demonstrate their use.	1 0	
iii) Demonstrate the pro-	cedures to cut threads on	
pipes by selecting appropr	iate die.	
iv) Demonstrate the ab	ility to identify different	
pipes pipe material and m	hethods to join the pipes	
v) Identify various taps	cocks and valves used in	
sanitary System demonst	rate ability to repair them	
(ship specific)	rate ability to repuir them	
vi) Identify various plumb	ing accessories such as 'T'	
ioint socket reducer a	danter etc used in nine	
fitting and demonstrate its	use	
vii) Cut the gasket as	ner sketch by selecting	
vii) Cut uit gasket as	pole	
appropriate material and to	JUIS.	
	ny to clear choked pipes in	
accommodation plumbi	ing system by using	
appropriate tool / choke cl	earing material	

\*There will be continuous assessment of skills being acquired through class work, practical and periodic assignments / project works / tests/ orals etc.

\*Journal to be submitted at the end of each term for assessment

NOTE: A candidate has to secure minimum percentage /grade: 50 % as per Training Circular No 4 of 2005 by DG Shipping, Govt of India

#### **Reference Books:-**

- 1. Basic Marine Engineering
- 2. Engineering knowledge for Deck Officers
- 3. General Engineering knowledge Vol. 8
- 4. Mechanical Engineering Science
- 5. Marine Auxiliary Machinery
- 6. A text book of Workshop practice

7. Unitor Welding Handbook

J.K. Dhar Reed Reed Hannah & Hiller Smith R.S.Khumri and J.K.Gupta

8. A Guide to Safety and Health at Work for Gas Welding and Flame Cutting – Occupational Safety and Health Branch Labor Department

9. Introduction to Hydraulic and pneumatic S.Ilango& V. Soundararajan

## Scheme of Examination:

The performance of the learners shall be evaluated into two parts. The learner's performance shall be assessed by Internal Assessment with 25% marks in the first part & by conducting the Semester End Examinations with 75% marks in the second part.

The Course having Practical training will have Practical Examination for 50 marks at the end of Semester, out of which 40 marks for the Practical task assigned at the time of examination. The 10 marks are allotted Oral/Viva/Journal.

The allocation of marks for the Internal Assessment and Semester End Examinations are as shown below:-

**Internal Assessment**: It is defined as the assessment of the learners on the basis of continuous evaluationas envisaged in the Credit based system by way of participation of learners in various academic and correlated activities in the given semester of the progamme.

**Semester End Assessment**: It is defined as the assessment of the learners on the basis of Performance in the semester end Theory/ written/ Practical examination.

#### **Modality of Assessment :**

#### Internal Assessment - 25% - 25 Marks

A	) Theory	25 marks
Sr No	Evaluation type	Marks
1	One class Test (multiple choice questions objective)	20
2	Active participation in routine class instructional deliveries. Overall conduct as a responsible student, manners, skill in articulation, leadership qualities demonstrated through organizing co-curricular activities, etc.	05

#### **B**) External examination - 75 %

#### **Semester End Theory Assessment - 75%**

#### 75 marks

- i. Duration These examinations shall be of 2.5 hours duration.
- ii. Theory question paper pattern :-
  - 1. There shall be five questions.
    - 2. 1<sup>st</sup> question will be objective type from entire syllabus, 2<sup>nd</sup> question from unit 1, 3rd question from unit 2 and 4th Question from unit 3 and 5th question examiners choice.
  - All questions will be 15 marks each.
     All questions shall be compulsory with internal choice within the questions for question number 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>& 5<sup>th</sup>.
  - 5. Questions may be sub divided into sub questions a, b, c, d & e only & the allocation of marks depends on the weight age of the topic.

#### **Practical External Assessment**

#### 50 marks