



COURSE: High Voltage Engineering		
DEGREE: Electrical Engineering	YEAR: 3	TERM: 2

La asignatura tiene 28 sesiones que se distribuyen a lo largo de 14 semanas. Los laboratorios pueden situarse en cualquiera de ellas. Semanalmente el alumnos tendrá dos sesiones, excepto en un caso que serán tres

WEEKLY PLANNING									
WEEK	SESSION	DESCRIPTION	GROUPS (mark X)		SPECIAL ROOM FOR SESSION (Computer class room, audio-visual class room)	Indicate YES/NO If the session needs 2 teachers	WEEKLY PROGRAMMING FOR STUDENT		
			LECTURES	SEMINARS			DESCRIPTION	CLASS HOURS	HOMEWOR HOURS (Max. 7h week)
1	1	Course presentation. High Voltage electrical apparatus. Insulation coordination. Electrical stresses. Asset management. Insulating gases. Electrical discharges at DC voltages.		X			Check notes and chapter 1 y section 3.3 from the book "Coordinación de aislamiento en redes eléctricas de Alta Tensión" by J.A. Martínez Velasco.	1,6	3
1	2	Insulating gases. Electrical discharges at DC voltages. Air as electrical insulation.	X			Check section 3.3 from book "Coordinación de aislamiento en redes eléctricas de Alta Tensión" by J.A. Martínez Velasco.	1,6		
2	3	Properties of SF ₆ . Insulating liquids. Applications and Degradation		X		Check sections 3.3, 3.5 and 3.6 from book "Coordinación de aislamiento en redes eléctricas de Alta Tensión" by J.A. Martínez	1,6	5	

		mechanisms. Insulating solids. Thermal, mechanical and electrical stresses.					Velasco.		
2	4	Insulating solids. Thermal, mechanical and electrical stresses. Partial discharges. Equivalent circuit. Tangent δ .	X				N	Check section 3.6 from book "Coordinación de aislamiento en redes eléctricas de Alta Tensión" by J.A. Martínez Velasco.	1,6
3	5	Exercises about insulating materials. High voltage AC generation circuits.		X			N	Check notes. Check section 2.2 from book by Kuffel and Zaengl.	1,6
3	6	High voltage AC and DC generation circuits. High Voltage impulse generators.	X				N	Check chapter 2 from book by Kuffel and Zaengl.	1,6
4	7	1st partial examination.		X			N	Study chapter 2 from the course.	1,6
4	8	High Voltage impulse generators. High voltage voltmeters. HV Dividers.	X				N	Check chapters 2 and 3 from book by Kuffel and Zaengl.	1,6
5	9	Electrical insulation design. Electrical stresses assessment in simple geometries.		X			N	Check sections 3.1 and 3.2 from book "Coordinación de aislamiento en redes eléctricas de Alta Tensión" by J.A. Martínez Velasco; and chapter 4 from book by Kuffel and Zaengl.	1,6
5	10	Electrical insulation design. Dielectric breakdown from common materials. Paper impregnation in HV transformers and VPI treatment in rotating machines	X				N	Check chapter 3 from book "Condition assessment of High Voltage Insulation in Power System Equipment" by R.E. James.	1,6
6	11	Lab session: General issues and security. Lightning impulses.		X	12D15		Y	Study practical guidelines. Solve previous questions proposed.	1,6
6	12	Degradation mechanisms in electrical equipment: bushings, insulators, capacitors, power lines, power cables, power transformers.	X				N	Check chapter 4 from book "Condition assessment of High Voltage Insulation in Power System Equipment" by R.E. James.	1,6
7	13	Degradation mechanisms in electrical equipment: power transformers and rotating machines. Testing techniques for HV equipment: insulation resistance measurement.		X			N	Rotating machines: check chapter 8 from book by G. Stone. Power transformers: check chapter 4.2 from book by P. Gill. Also, chapter 5.2 from book by R.E. James.	1,6
7	14	Testing techniques for HV equipment: insulation resistance measurement. Application.	X				N	Check chapter 2 from book "Electrical Power Equipment Maintenance and Testing" by P.	1,6

		Testing techniques for HV equipment: AC and DC hipot. Applications.					Gill. Check chapter 18 from book "High Voltage Engineering" by M. Khalifa. Also, chapters 2 and 3 from book "Electrical Power Equipment Maintenance and Testing" by P. Gill.		
8	15	Exercises about electrical fields calculations in simple geometries.		X		N	Solve proposed exercises.	1,6	
8	16	Testing techniques for HV equipment: lightning and switching impulses. Applications.	X			N	Check chapter 18 from book "High Voltage Engineering" by M. Khalifa.	1,6	5
9	17	2nd partial examination.		X		N	Study chapters 3, 4 and 5 from the course.	1,6	
9	18	Testing techniques for HV equipment: capacitance and tangent δ . Applications.	X			N	Check chapter 2 from book "Electrical Power Equipment Maintenance and Testing" by P. Gill.	1,6	5
10	19	Lab session: Insulation resistance measurement in one power transformer and surge test in rotating machinery.		X	12D15	Y	Study practical guidelines. Solve previous questions proposed.	1,6	
10	20	Testing techniques for HV equipment: Partial discharges. Physical principles and equivalent circuit.	X				Check book "Partial Discharge Detection in High-Voltage Equipment" by Kreuger. Also check notes provided by professor.	1,6	5
11	21	Lab session: capacitance and tangent δ .		X	12D15	Y	Study practical guidelines. Solve previous questions proposed.	1,6	
11	22	Testing techniques for HV equipment: Partial discharges. Test methodology and data interpretation.	X				Check notes provided by professor.	1,6	6
12	23	Lab session: Voltage distribution in air-solid insulating systems. PDIV. Dielectric breakdown and Weibull statistics.		X	12D15	N	Review chapters 2,3 and 4 from the course.	1,6	
12	24	Testing techniques for HV equipment: Specific techniques for power transformers and rotating machines.	X			N	Check chapter 4.2 from book "Electrical Power Equipment Maintenance and Testing" by P. Gill. Check chapters 12, 13 and 14 from book "Electrical Insulation for Rotating Machines" by G. Stone.	1,6	5
13	25	Lab session: Partial discharges standard test.		X	12D15	N	Review notes from professor.	1,6	
13	26	Testing techniques for HV equipment: Specific techniques for rotating machines. Fault location in power cables.	X			N	Check chapter 4.2 from book by P. Gill. Check chapter 9 from book by R.E. James.	1,6	5

							Review bridge circuits		
14	27	3rd partial examination.		X		N	Study chapter 6 from the course.	1,6	6
14	28	Oral presentations for voluntary works.	X			N		1,6	3
Subtotal 1								46,66	77
Total 1 (Hours of class plus student homework hours between weeks 1-14)								127.33	

15		Tutorials, handing in, etc							
16		Assessment					Study all chapters from the course.	2	10
17									
18									
Subtotal 2								2	10
Total 2 (Hours of class plus student homework hours between weeks 15-18)									

TOTAL (Total 1 + Total 2. Maximum 180 hours)									
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