***Preliminary schedule of the course “Wood science and technology” – 15 pts.***

***20th January-- 24th March 2020 (SG0213)***

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| --- | --- | --- | --- | --- |
| ***Date*** | ***Time*** | ***Topic*** | ***Hours\**** | ***Lecturers*** |
| 20/01 | 13:00-14:45 | ***Introduction- structure and organization of the course.***  ***Key concepts and limitations of the course***: sustainable development, biomaterials, bio-refinery, green technologies. Division into groups & study tasks. | 2 | GD, NT |
|  |  |  |  |  |
|  |  | ***Wood science (WS)*** |  |  |
| 21/01 | 09:00-11:45 | Chemistry of wood and extractives | 3 | MJ |
|  | 13:00-13:45 | Variations and interrelations between the wood properties. Statistical tools in wood science | 1 | NT |
| 22/01 | 9:00-11:45 | Anatomy of softwoods | 3 | GD |
|  | 13:00-15:45 | ***Practice***: Microscopy of softwoods | 3 | GD, DF |
| 23/01 | 09:00-11:45 | Anatomy of hardwoods | 3 | GD |
|  | 13:00-15:45 | ***Practice***: Microscopy of hardwoods | 3 | GD, DF |
| 24/01 | 09:00-11:45 | Durability of wood to fungi, insects and marine borers. | 3 | GD |
|  |  | **Weekend** |  |  |
|  |  |  |  |  |
| 27/01 | 09:00-11:45 | Durability of wood to fungi, insects and marine borers. | 3 | GD |
|  | 13:00-15:45 | ***Practice:*** Anatomy of wood decay | 3 | GD, DF, |
| 28/01 | 09:00-11:45 | Physical properties of wood. Density, wood-water relationships, shrinkage & swelling. | 3 | NT |
|  | 13:00-13:45 | Colour, odour, thermal and acoustic properties of wood | 1 | NT |
| 29/01 |  | Self-studies, working in groups |  |  |
| 30/01 | 09:00-9:45 | Mechanical properties of wood | 1 | NT |
|  | 10:00-10:45 | Weathering of wood and consequences | 1 | MJ |
|  | 11:00-11:45 | Brief review – most used timbers of the world | 1 | NT |
|  | 13:00-15:45 | ***Practice***: Testing of physical-mechanical properties | 3 | NT |
| 31/01 |  | Self-studies, working in groups |  |  |
|  |  | **Weekend** |  |  |
|  |  |  |  |  |
|  |  | ***Sawmilling of solid wood (SM)*** |  | NT |
| 03/02 | 09:00-9:45 | Soft- and hardwood timber classes | 1 | NT |
|  | 10:00-10:45 | Sawmilling – storage of timber | 1 | NT |
| 04/02 | 10:00-13:30 | ***Practice:* Visit** **to sawmill in Uppsala area** | 3 | NT, GD, MJ |
| 05/02 | 09:00-10:45  11:00-11:45  13:00-13:45  14:00-15:45 | Sawmilling – measuring of timber; classes  Sawing of timber – methods and sawn products  Sawing of timber – methods and sawn products  Wood decay continuation | 2  2  2 | NT  NT  GD |
| 06/02 |  | Self-studies |  |  |
| 07/02 | 13:00-15:00 | ***Seminar 1***, group presentations & discussion (WS) | 2 | **All staff** |
|  |  | **Weekend** |  |  |
|  |  |  |  |  |
|  |  | ***Pulp and paper*** |  |  |
| 10/02 | 09:00-11:45  13:00-13:45 | Pulp and paper – mechanical processing | 4 | DF |
| 11/02 | 09:00-11:45  13:00-13:45 | Pulp and paper –chemical processing | 4 | GD |
| 12/02 | 08:30- | ***Practice:*** **Pulp mill visit, Kvarnvedens (prel.), Börlange StoraEnso** | 3 | GD, DF, NT |
| 13/02 |  | Self-studies |  |  |
| 14/02 | 09:00-11:45 | ***Seminar 2***, group presentations & discussion Sawmilling + Pulp & paper | 3 | **All staff** |
|  |  | **Weekend** |  |  |
|  |  |  |  |  |
|  |  | ***Wood products and biomaterials*** |  |  |
| 17/02 | 09:00-10:45 | ***Bio-composites***: adhesives, bio-based binders and non-conventional bonding | 2 | MJ |
|  | 11:00-11:45  13:00-13:45 | Wood-based composites: veneer, plywood, fiber- and particle boards, OSB | 2 | NT |
| 18/02 | 09:00-11:45  13:00-16:00 | Nano-based biomaterials - Modern approaches for utilizing of cellulose, hemicelluloses and lignin in new products and processes. Concepts of modern biorefineries, bio-mills and full scale production of biocomponents for advanced products; Production of nanocellulose for biocomposites /nanocomposites and other industrial applications including medical/oil industries.  ***Practice:*** Work with various fiber bio-materials | 3  3 | GD  GD, DF, MJ |
| 19/02 | 09:00-11:45  13:00-14:45 | Nano-based biomaterials (continuation) | 2 | GD, MJ, DF |
| 20/02 | 08:30- | ***Practice:* Visit to Arizona chemicals (prel.), Söderhamn** | 3 | GD, NT |
| 21/02 | 10.00-11:45 | Wood-based composites: Cross-laminated timber (CLT) and laminated veneer lumber (LVL). Wood fiber insulation | 3 | JF |
|  | 13:00-15:45 | Wood thermoplastic composites | 2 | MJ |
|  |  | **Weekend** | 3 |  |
|  |  |  |  |  |
|  |  | ***Industrial wood protection*** |  |  |
| 24/02 | 09:00-9:45 | Aims of wood protection. Biocides used for chemical wood protection. | 1 | MJ |
|  | 10:00-11:45 | Impregnated timber-processing and treated items | 2 | NT |
|  | 13:00-14:45 | ***Practice:*** Demonstration of impregnation and penetration of chemical. Hygrophobation of wood | 2 | NT, MJ |
| 25/02 | 09:00-11:45 | Wood modification – aims, mode of action and methods. Acetylation, furfurylation, DMDHEU and other modification methods. Novel approaches for wood modification | 3 | MJ |
|  | 13:00-14:45 | Thermal modification of wood | 2 | JG |
| 26/02 |  | Self-studies, working in groups |  |  |
| 27/02 |  | Self-studies, working in groups |  |  |
| 28/02 | 09:00-11:45 | ***Seminar 3, group presentations & discussion (WP & IWP)*** | 3 | **All staff** |
|  |  | **Weekend** |  |  |
|  |  |  |  |  |
|  |  | ***Bioenergy, biofuels, wood construction*** |  |  |
| 02/03 | 09:00-10:45 | Use of bio-renewable resources for energy – wood, herbaceous crops, algae | 2 | JJ |
|  | 11:00-11:45  13:00-13:45 | Conversion of biomass into heat and power by direct combustion, thermal gasification and anaerobic digestion | 2 | JJ |
| 03/03 | 09:00-10:45 | Processing of biomass into chemicals and fuels: breakdown to sugars, alcohols, biodiesel and thermochemical conversion | 2 | MS |
|  | 11:00-11:45  13:00-14:45 | ***Construction timber in buildings*** - modern developments for using solid wood & glulam in high buildings & bridges. | 3 | NT |
| 04/03 | 09:00-11:45  13:00-13:45 | ***Other biomaterials*** – Non-wood fibers (bamboo, hemp, rattan, flax) available and biological/physical/mechanical characteristics, properties and limitations. Current commercial uses of non-wood fibre materials in composites and their potential and competition to wood fibers. | 4 | DF, NT |
| 05/03 |  | Self-studies, working in groups |  |  |
| 06/03 | 09:00-11:45 | ***Seminar 4*, *group presentations & discussion (B & BF)*** | 3 | **All staff** |
|  |  | **Weekend** |  |  |
|  |  |  |  |  |
| 09/03 |  | Self-studies |  |  |
| 10/03 |  | Self-studies |  |  |
| 11/03 |  | Self-studies |  |  |
| 12/03 |  | Self-studies |  |  |
| 13/03 | 09:00-11:45 | **Consultation before the examination** | 3 | **All staff** |
|  |  | **Weekend** |  |  |
|  |  |  |  |  |
| 16-19/03 |  | ***Pre-examination studies*** |  |  |
| 20/03 | 09:00-12:00 | **Examination** | 3 | **All staff** |
|  |  |  |  |  |
|  |  | ***TOTAL: 76 h lectures, 30 h practice + consult., 12 h seminars*** |  |  |

\**Academic hour equal to 45 min*

***Lecturers:***

NT Prof. Nasko Terziev (S-Faculty, SLU)

GD Prof. Geoffrey Daniel (S-Faculty, SLU)

DF Dr. Dinesh Fernando (S-Faculty, SLU)

MJ Doc. Mohamed Jebrane (S-Faculty, SLU)

JG Dr. Jie Gao (S-Faculty, SLU)

MS Prof. Mats Sandgren (NR Faculty, SLU)

JJ Prof. J. Jayasuriya (KTH)

***Place:*** The seminar room, Dept. Biomaterials & Technology, SLU, Vallvägen 9C, 750 07 Uppsala

***Language:*** English