Syllabus and Schedule

Week 1: 01/15, 01/17
Week 2: 01/22, 01/24
Module 1: Introduction
a) Noninvasive imaging in biology and medicine (theory, application and limitation)
b) Biological barriers
c) Targeted imaging approaches (active vs. passive and combination)
d) Strategies for identifying molecular markers of disease and ligand screening

Week 3: 01/29, 01/31
Week 4: 02/05, 02/07
a) Imaging probes and broader classifications
b) Small molecule-based imaging probes
c) Importance of “nano”: nanoparticulate imaging probes
d) Synthetic strategies for probe developments
e) Toxicology and pharmacology (in vivo distributive characteristics)
f) Drug delivery strategies
g) Discussion: Primary paper, group presentation (Group 1), Class-room quiz, HW1 assigned

Week 5: 02/12, 02/19
Week 6: 02/26, 02/28
Module 2: Discussion of various imaging modalities
Molecular computed tomographic (CT) imaging
a) Principle of CT and prerequisites, next generation CT, photon counting, dual energy
b) Imaging probes for CT
c) Specific application in CVD and oncology
d) Challenges and advanced reading
e) Discussion: Primary paper, group presentation (Group 2), HW1 due, HW2 assigned

Week 7: 03/05, 03/07
Week 8: 03/12, 03/14
Molecular magnetic resonance (MR) imaging
a) Principle of MR and prerequisites
b) Imaging probes for MR
c) Specific application in CVD and oncology
d) Challenges and advanced reading
e) Discussion: Primary paper, group presentation (Group 3), Class-room quiz, HW2 due, HW3 assigned

Week 9: Spring Break (03/16-03/24)
Week 10: 03/26, 03/28
Nuclear imaging
a) Principle of nuclear imaging and prerequisites
b) Imaging probes for PET/SPECT
c) Specific application in CVD and oncology
d) Challenges and advanced reading

**Week 11: 03/28, 03/30**

a) Discussion: Primary paper, group presentation (Group 4), Class-room quiz, HW4 due, HW5 assigned  
b) Midterm Exam; Project introduction and review

**Week 12: 04/02, 04/04**  
**Week 13: 04/09, 04/11**  
Nuclear imaging  
a) Principle of ultrasound (US) imaging and prerequisites, photoacoustic imaging  
b) Imaging probes for US and photoacoustic imaging  
c) Specific application in CVD and oncology  
d) Challenges and advanced reading  
e) Discussion: Primary paper, group presentation (Group 5), Class-room quiz, HW5 due, HW6 assigned

**Week 14: 04/16, 04/18**  
**Week 15: 04/23, 04/25**  
Advanced topics  
a) Image-guided therapeutics  
b) Image-guided prototyping  
c) Imaging and Immunotherapy  
d) Radiation therapy and Imaging  
e) Discussion: Primary paper, group presentation (Group 6), Class-room quiz, HW6 due

**Week 16: 04/30**  
Module 3: Clinical Translation and Regulatory Matters  
Factors affecting clinical translation  
a) Fundamental regulatory aspects  
b) Ethical issues  
c) Challenges and advanced reading

**Week 17: 05/02 (Reading Day)**  
Final Exam, Final project report due