

Tentative plan for 02157 Functional Programming (Autumn 2021)

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Textbook: [Functional Programming using F#, Michael R. Hansen and Hans Rischel, Cambridge University Press, 2013](#). (Abbreviated HR.)

Week	Date	Topic	Read	Exercises
35	3. Sept.	Course introduction Intro. to functional programming and F# Lists (brief introduction)	HR 1, HR 2.1-2.6, HR 4.1-4.3	1. HR 1.4, HR 1.6, HR 2.8, HR 4.7 2. Mini-project on polynomials: Part 1 See Material folder on DTU Learn
36	10. Sept.	Functions, Basic types, Tuples and Lists	HR 2, HR 3.1-3.3, 3.5, 3.6 HR 4.1 - 4.4	1. HR 2.1, 2.2, 2.13, 4.3, 4.8, 4.9, 4.12, 4.16 2. Consider your solution to 4.7 and make an evaluation of 'multiplicity 2 [1; 2; 8; 2]' 3. Addendum to Exercise on polynomials: Part 1 Declare a higher-order function: f so that add = f(+) and sub = f(-) 4. Exercise on polynomials: Part 2. You may also consider/start on Part 3
37	17. Sept.	Programming as a model-based activity Property-based testing - Briefly	HR 3.4-3.7, HR 4	1. Paper and pencil exercises: HR 4.18. Give an argument for the type of f. 2. SimpleCompanyClub . 3. Exercise on sorting, correctness and property-based testing 4. Exercise on polynomials: Part 3. you may also consider start on Part 5 (invariant checking).
38	24. Sept.	Disjoint union (Tagged values) Higher-order list functions	HR 3.8-3.11, HR 5.1	1. Polynomial exercise: 1. Part 4 2. Give a declaration of <code>multC</code> using higher-order functions from the List library. 2. HR 5.3 3. Make a revised version of the Cash register example in Section 4.6 where: 1. The function <code>findArticle</code> is replaced by an application of <code>List.tryFind</code> 2. The function <code>makeBill</code> is declared using <code>List.foldBack</code> 4. Solve the following two problems from old exams, where you should start with solutions based on "plain" recursive functions. Provide, thereafter, solutions to questions using functions from the List library, when that makes sense. 1. Problem 2 from Exam, Summer 2015. 2. Problem 1(questions 1- 5) from Exam, Fall 2013. Some old exams can be found here

				5. You may actually start on Part 5 of the exercise on polynomials.
39	1. Oct.	Collections: Sets and Maps Property-based testing	HR 5.2-5.3	<ol style="list-style-type: none"> 1. Revise your solution of the simple company club problem (Week 38) using sets and maps whenever that is appropriate. 2. Problem 1, questions 6 from Exam, Fall 2013. 3. Solve Problem 4 from the exam summer 2015 (available here). Make a solution on paper first -- the final exam will be laptop-free. Try out your program. 4. Part 5 of the exercise on polynomials.
40	8. Oct.	Modules	HR 7	<ol style="list-style-type: none"> 1. ExercisesWeek6.pdf 2. Part 6 of exercise on polynomials
41	15. Oct.	Finite trees (I)	HR 6	<ol style="list-style-type: none"> 1. File System 2. Part 2 from Mini-project 2: Simple Compiler 3. Thereafter you can continue with Part 1, Part 3 and Part 4 of Mini-project 2
42	22. Oct.	Autumn vacation		
43	29. Oct.	Finite trees (II)	HR 6	<ol style="list-style-type: none"> 1. Solve Problem 2 from the exam fall 2011 (available here). 2. Make an interpreter for a simple imperative language (see exercises on the slides) by completion of this program skeleton. 3. Continue with mini-project 2. 4. Solve Problem 3 from the exam fall 2015 (available here).
44	5. Nov.	Efficiency: Tail recursion (I) Monadic programming: briefly <ul style="list-style-type: none"> • Handling States • Exceptional cases 	HR 9.1-9.5	<ol style="list-style-type: none"> 1. 9.3, 9.4 2. Summer exam 02157-2014, Problem 1(1-3.1) -- available here 3. Fall exam 02157-2015, Problem 2(1,2.1,3) -- available here 4. ExerciseWeek9.pdf
45	12. Nov.	Efficiency: Tail recursion (II) Type inference	HR 9.6	<ol style="list-style-type: none"> 1. 9.6, 9.8 2. Summer exam 02157-2014, Problem 1.3.2 3. Fall exam 02157-2013, Problem 2(1+2) 4. Fall exam 02157-2015, Problem 2.2.2 5. Fall exam 02157-2011, Problem 3 6. Mini-project on propositional logic <p>The old exam questions are available here</p>
46	19. Nov.	Sequences Lambda Calculus Briefly	HR 11	<ol style="list-style-type: none"> 1. 11.1, 11.2, 11.3, 11.9 2. ExerciseWeek11.pdf 3. Summer exam 2014, Problem 1(4,5) and Fall exam 2014, Problem 2(1,2,3) -- available here

47	26. Nov.	An old full exam set		<p>An old exam set is uploaded to Learn before the lecture.</p> <ol style="list-style-type: none">1. It should be solved by students in the auditorium and in the exercise class2. Remember to bring paper and pencil3. Solutions will be uploaded after lunch
48	3. Dec.	Course evaluation Short presentation: From Type Specifications to F# programs --based on Problems 2 and 3 from Summer Exam 2014		<ul style="list-style-type: none">• Problems 2 and 3 from Summer Exam 2014• OldExamsWeek13 from Material folder on DTU Learn

Michael R. Hansen, November 30, 2021